THE TOOL ENGINEER

OFFICIAL PUBLICATION: AMERICAN SOCIETY OF TOOL ENGINEERS

Behind every manufactured product is the tool engineer

Aircraft parts production on an experimental basis is swiftly and economically accomplished by Kellering such as this.

Another tricky part for experimental aircraft work. Imagine trying to produce parts like this in small lots by any other means. Kellering saves a terrific amount of time and money.

Small lots of aileron control cams are produced with accuracy and dispatch by Kellering.

"KELLERING"

...A SHORTER WAY OF SAYING

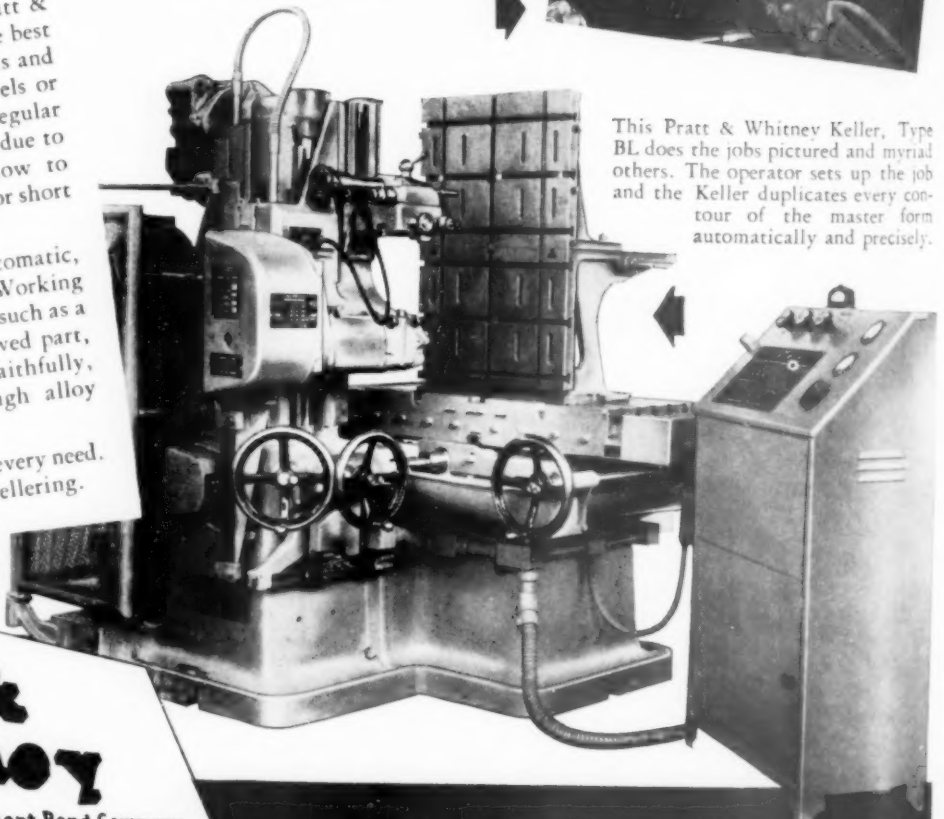
"fast, low cost duplication of parts in experimental lots or for short run production."

Difficult to duplicate? Not for the P&W Keller. It takes this catapult hook in stride.

Has it occurred to you that Pratt & Whitney *Keller* machines offer the one best way to duplicate not only dies, molds and patterns but actual parts, pilot models or production components, however irregular or intricate in shape? If not, you're due to revolutionize your thinking on how to turn out pieces in experimental lots or short runs.

Kellering is, in essence, automatic, electric, tracer-controlled milling. Working from an easily made master form, such as a light metal template or an approved part, it reproduces the desired shape faithfully, quickly, economically — in tough alloy steel or other material.

There is a Keller machine for every need. Write for the whole story on Kellering.



This Pratt & Whitney Keller, Type BL does the jobs pictured and myriad others. The operator sets up the job and the Keller duplicates every contour of the master form automatically and precisely.

Pratt & Whitney

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

Keller Machines

The Tool Engineer

Official Publication: American Society of Tool Engineers

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Feb., 1949

Vol. XXII, No. 2

Editorial

It Can Be Done

TODAY'S high prices are a subject of vast import to every person in this country. Like the weather, inflation is something that everyone talks about, but does little to remedy. Too many people treat it as though it were an incurable ill.

We, as tool engineers, know that there is one and only one way to bring prices down without disturbing our economic stability. That is by increasing productivity to the point that goods can be manufactured, and therefore sold, at a lower unit cost.

It is true that productivity is on the upgrade, advancing at a higher rate than the pre-war yearly average. But this is nullified by the fact that wages have not only been increasing, but have stayed a few steps ahead of production gains. Therefore, it is obvious that if we are to have a lower cost of living, productivity must be increased sufficiently to offset rising labor and materials costs.

Such an increase depends upon the men and machines of industry. Tool engineers essentially have an important part to play because of their professional relationship to both the men and machines.

The degree of obsolescence of plant equipment in this country is said to be greater than it was 20 years ago. In spite of the war time improvements in machine tools, about 90 percent of those being used by the metal-working industry are of pre-war design. It is not a question of shortages, for the machine tool builders are not working to more than one-half their capacity.

Of course, there are many reasons to explain why management has not modernized, but the fact remains that only the best of machines, the most efficient of processes will appreciably increase production. Tool engineers know better than most people what can be accomplished by the right machine on a particular job. This knowledge gives us a responsibility for assisting management along those lines.

Once a machine is installed and in operation, its results can be measured and used as ammunition in the fight for further mechanization and modernization. The human element in increasing productivity is less tangible than the mechanical, but very important.

Certain attitudes will have to prevail among the men of management and labor. While we sincerely hope the idea is not too widespread, a significant number of companies are facing 1949 with the attitude that some degree of financial depression must come about before production can be increased. To say the least, this is a defeatist attitude, which it would be well to replace with a constructive and progressive program of plant improvement and employee relations.

Workers must realize that they have a self-interest in their productivity over and above the weekly wage. At one time, man consumed directly the product of his labor. The significance of his volume of output was obvious. With the mechanization of industry, this has changed until man now produces almost 100 percent for others. It is the vitalness of this contribution to others that he must understand. He must realize that they in turn produce to fill his needs, that a complex society is based on interdependence and that his own well-being is eventually determined by the amount he produces for others.

In such teamwork lies the solution to the challenging problems of raising production to the point of lowering prices. It is a difficult problem, but it can be solved if men at all levels of industry will work together and utilize fully the machines available to them.

I. F. Holland

President 1948-49

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IF YOU DO PRODUCTION MILLING ON CAST IRON . . .

Are You Willing to Spend $348.00--To Make $3,336.50?

Then Read this Performance Report on the AXIAL FACE KENNAMILL

Long Life and Extremely Low Maintenance Are Cost-Saving Advantages of Solid Blade Axial Face Kennamill

The operation detailed in the table is a production job—where tooling costs are an important factor. It comprises straddle milling the top and bottom surfaces of cast iron cylinder heads.

Use of the Axial Face Kennamill reduced milling costs on this job 80%. And—this saving was made even though the competitive cutter was carbide-tipped, and performed exceptionally well.

The Axial Face Kennamill has extremely abrasion-resistant *solid Kennametal* blades, securely held in position by wedge construction, which prevents thermal strains and permits the high strength of Kennametal to be utilized. These blades can be sharpened at minimum expense in a standard tool and cutter grinder. No steel has to be ground. Only two readily-accessible blade surfaces need sharpening.

In the typical report shown at the right these facts stand out:
- Solid Kennametal blades last twice as long between regrinds
- More than 10 times as many regrinds can be made per blade
- Only one-half as much time is required to sharpen the cutter

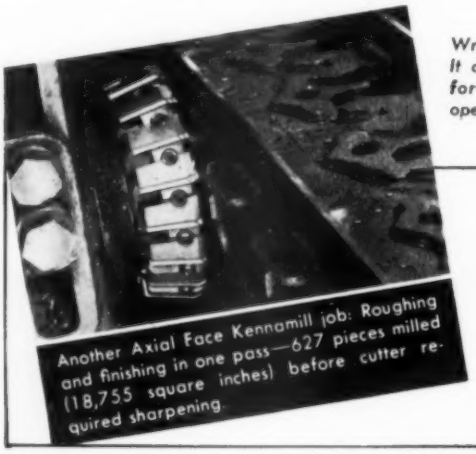
Ask our representative to show you what solid blade Axial Face Kennamills can do on your cast iron milling jobs.

KENNAMETAL®
SUPERIOR CEMENTED CARBIDES

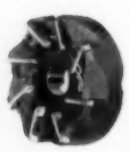
KENNAMETAL *Inc.*, LATROBE, PA.

Comparative Results	Competitive Cutter (Carbide Tipped Blades)	Axial Face Kennamill (Solid Kennametal Blades)
No. castings milled per 8 hr. shift	140	140
Number blades per pair of cutters	48	52
Cost per blade	$1.20 (est)	$4.20
Cost, two complete cutters	$312.00	$660.00
Number regrinds per blade	22	250
Number castings milled per grind	140	280
Number hours between grinds	8	16*
Blade cost per 8 hour shift	$2.618	$.437
Blade cost per casting milled	$.01870	$.00312
Time to grind cutter	90 min.	45 min.
Hourly grinding cost (est)	$4.00	$4.00
Grinding cost *per 8 hour shift* or per 140 castings	$6.00	$1.50*
Grinding cost per casting milled	$.0428	$.0107
Total blade and grinding cost Per 8 hour shift	$8.61	$1.937
Per casting milled	$.0615	$.0138
Per year (2 shifts, 5 days, 50 weeks)	$4,305.00	$968.50
**Reground once every other shift*		
Annual savings . . . . . at an increased first cost of		**$3,336.50 $348.00**

Write for Catalog 48. It describes Kennamills for most face-milling operations.



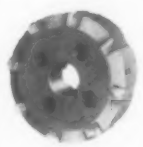
Another Axial Face Kennamill job: Roughing and finishing in one pass—627 pieces milled (18,755 square inches) before cutter required sharpening.



"UNIVERSAL" FACE KENNAMILL
(Solid blades)

"CF" KENNAMILL
(Solid blades)

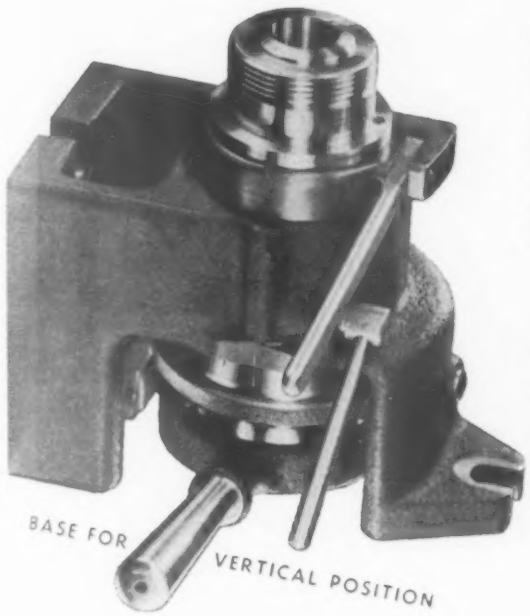
STEP KENNAMILLS
(Kennametal—tipped blades)



"ODD-JOB" FACE KENNAMILL
(Kennametal—tipped blades)

HARDINGE HORIZONTAL - VERTICAL

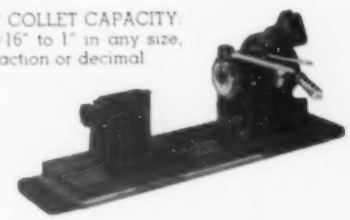
Collet Index Fixtures with Threaded Nose Spindle are fast in operation and hold work accurately



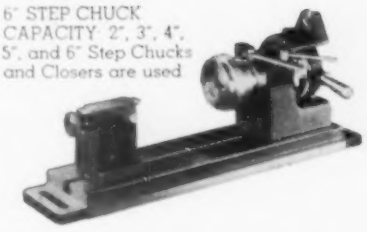
In addition to taking standard collets, this fixture takes step chucks and jaw chucks to cover a wide range of applications. It will eliminate the necessity of your tool room making many specially designed fixtures. Thus, your engineers and tool-makers will have more time for other work.

A preselector arrangement provides the selection of separate indexing of any number divisible into 20 or 24. The collet closer lever has a 100 to 1 leverage for quick opening and closing of collets and step chucks. Write for bulletin.

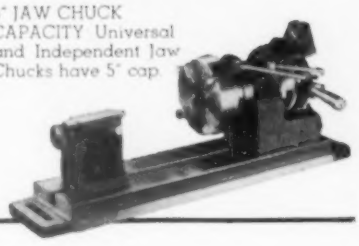
1" COLLET CAPACITY. 1/16" to 1" in any size, fraction or decimal



6" STEP CHUCK CAPACITY. 2", 3", 4", 5", and 6" Step Chucks and Closers are used



5" JAW CHUCK CAPACITY. Universal and Independent Jaw Chucks have 5" cap.



HARDINGE
ELMIRA, N.Y.

HARDINGE-SJOGREN SPEED COLLET CHUCKS

increase production of your lathes and milling machines

A Hardinge-Sjogren Nose Type Speed Collet Chuck enables you to get full value from your toolroom lathes, engine lathes and milling machines. It gives greater capacity, saves time, increases accuracy and assures better results. An almost effortless turn of the handwheel, one way or the other, automatically opens or closes the collet, releasing or gripping the work as desired. Its grip is adjustable and sure. Production is increased as the operator is always in front of his work. Available in these sizes . . . 1", 1 3/8", 1 3/4", 2 1/4", or 3 1/2" collet capacity. Write for bulletin.

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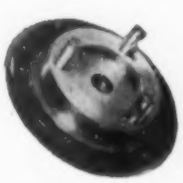
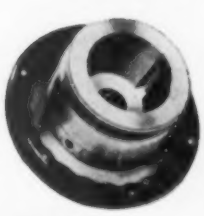
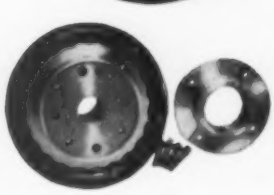


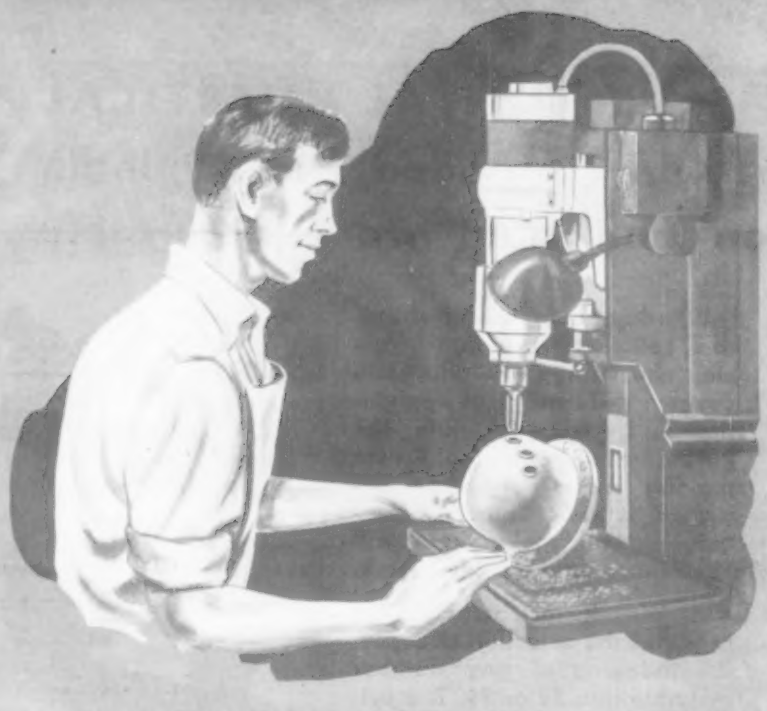
For TAPERED KEY-DRIVE SPINDLES



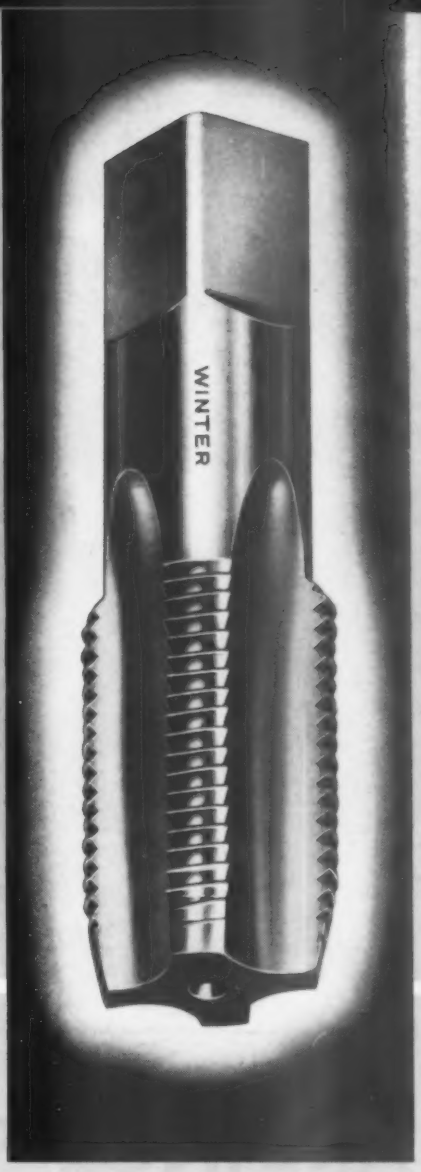
For THREADED NOSE SPINDLES



HARDINGE BROTHERS, INC., ELMIRA, N. Y.



WINTER TAPS IN ACTION!



Where tight, close joints are required, for pipe or similar applications, WINTER TAPER PIPE TAPS have proved their efficiency. Winter taper pipe taps are also furnished with interrupted thread for tapping tough metals, or metals that tend to load up on the tap. In addition to taper pipe taps, Winter offers a complete line of taps and dies, including chip driver, hand, machine screw, nut, pulley, stove bolt, and tapper taps.

ALWAYS AT YOUR SERVICE

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company
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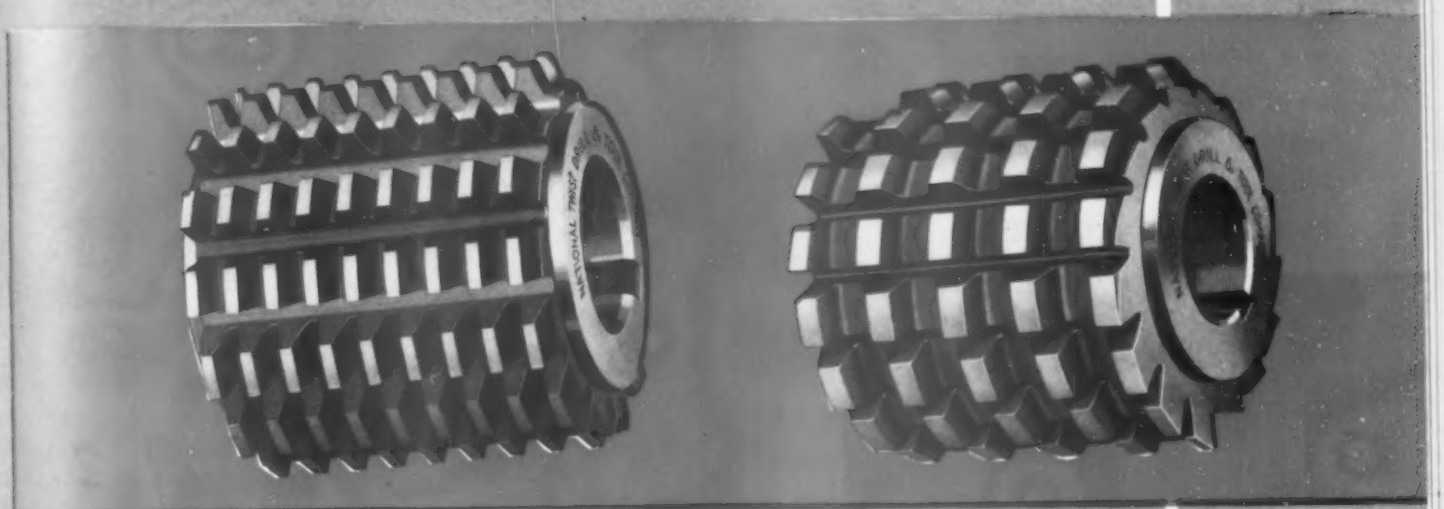
NATIONAL TWIST DRILL & TOOL CO. ROCHESTER, MICH., U.S.

National

NATIONAL CUTTING TOOLS ON THE JOB!



NATIONAL GEAR HOBS and SPLINE SHAFT HOBS are made under closely controlled hardening and manufacturing conditions. Due to these closely controlled conditions, maximum accuracy and tool life can be expected. Other types of National Hobs for roller and silent chain sprockets as well as for special shapes are made to individual specifications. National also manufactures a complete line of rotary metal cutting tools, including twist drills, reamers, counterbores, milling cutters, end mills, and special tools.

CALL YOUR DISTRIBUTOR

LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL cutting tools. Call them for cutting tools or any other staple industrial products.

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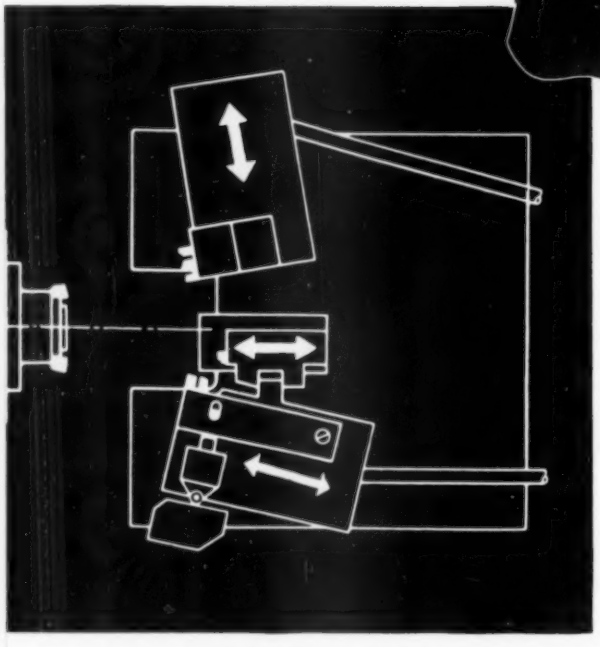

THE SIMPLIMATIC's large platen table provides a platform upon which tool slides may be mounted in any position. Above is a typical tool layout—designed for machining bevel gear blanks. Angular feeds are no problem. Compound slides are seldom needed. Write for literature.

THE GISHOLT ROUND TABLE represents the collective experience of specialists in machining, surface-finishing and balancing of round or partly round parts. Your problems are welcomed here.

COMPLETE FREEDOM IN PLACING TOOL SLIDES

... enables you to meet your own specific needs for high-speed automatic machining ... and do it with a standard machine.

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TURRET LATHES • AUTOMATIC LATHES
SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

LOOK

at this hacksawing record!

PERFORMANCE of a single "JET-EDGE" Blade

MONDAY
40 pieces 3¼" Nitroloy

TUESDAY
50 pieces 1" x 5"
Cold Rolled Steel

WEDNESDAY
40 pieces 4½" 50 Carbon
Chrome Moly Steel

THURSDAY
10 pieces 4½" 50 Carbon
Chrome Moly Steel
12 pieces 6" Standard Steel Pipe
30 pieces ¾" x 5" SAE 1020

FRIDAY
4 pieces 6¾" Rytense

SEE what "Jet-Edge" can do for you.

In metal cutting, records like this mean money saved. "Jet-Edge," that rugged, unbreakable new blade with a super high speed edge welded to an extra strong back, will out-perform the best blade you've ever used. It will actually save you 20% to 50% on your power hacksawing costs, even under toughest cutting conditions.

WRITE for a free demonstration.

Find out *why* and *how*. We'll be glad to arrange a demonstration on your own work. No obligation — except an open mind for one of the most astounding performances you have ever seen.

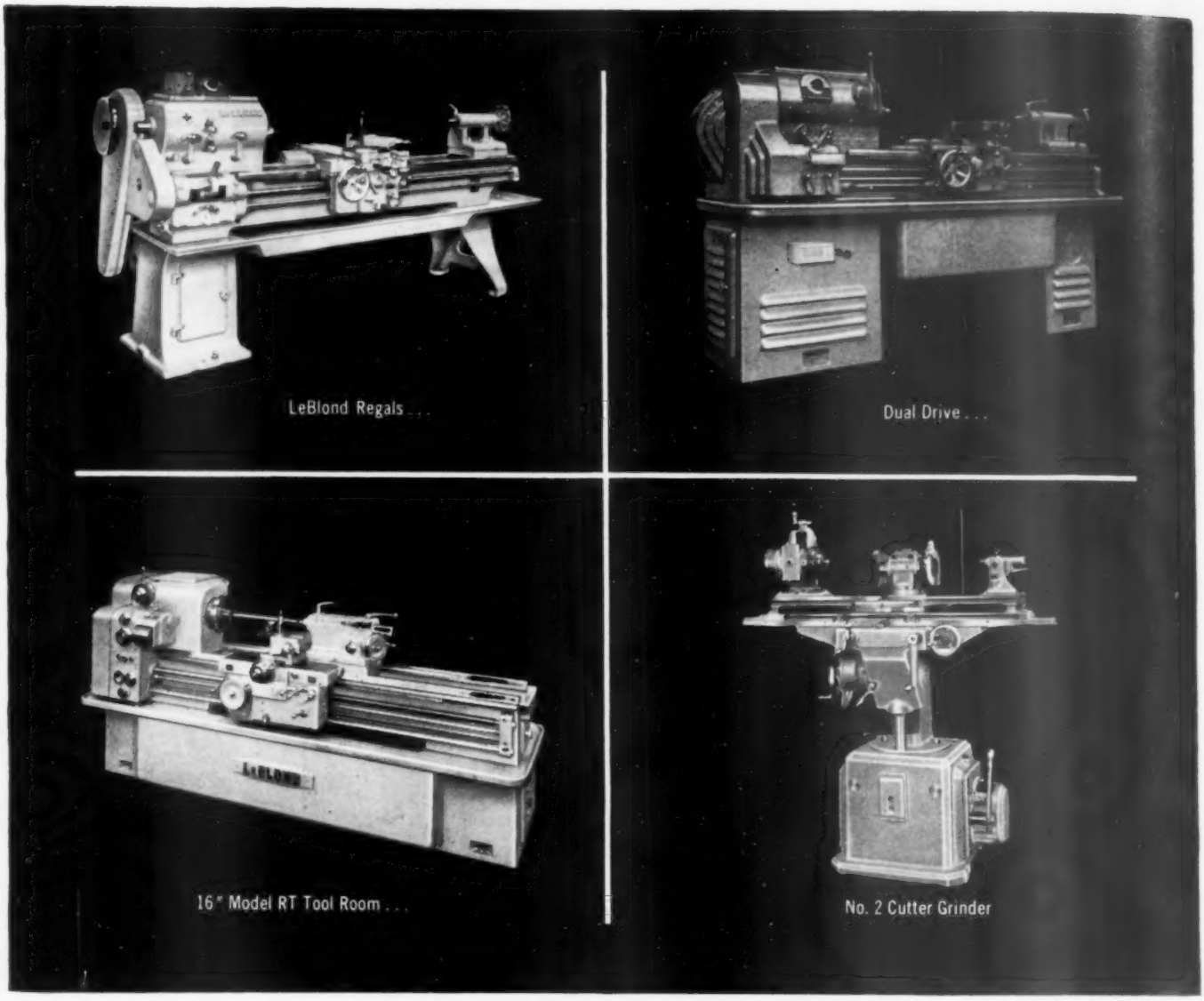
MILLERS FALLS COMPANY, Dept. B
Greenfield, Massachusetts

MILLERS FALLS TOOLS

It's new!

It's "Jet-Edge"!

It's Millers Falls!



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LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES.
SALES OFFICES: New York, Chicago, Philadelphia, Detroit.

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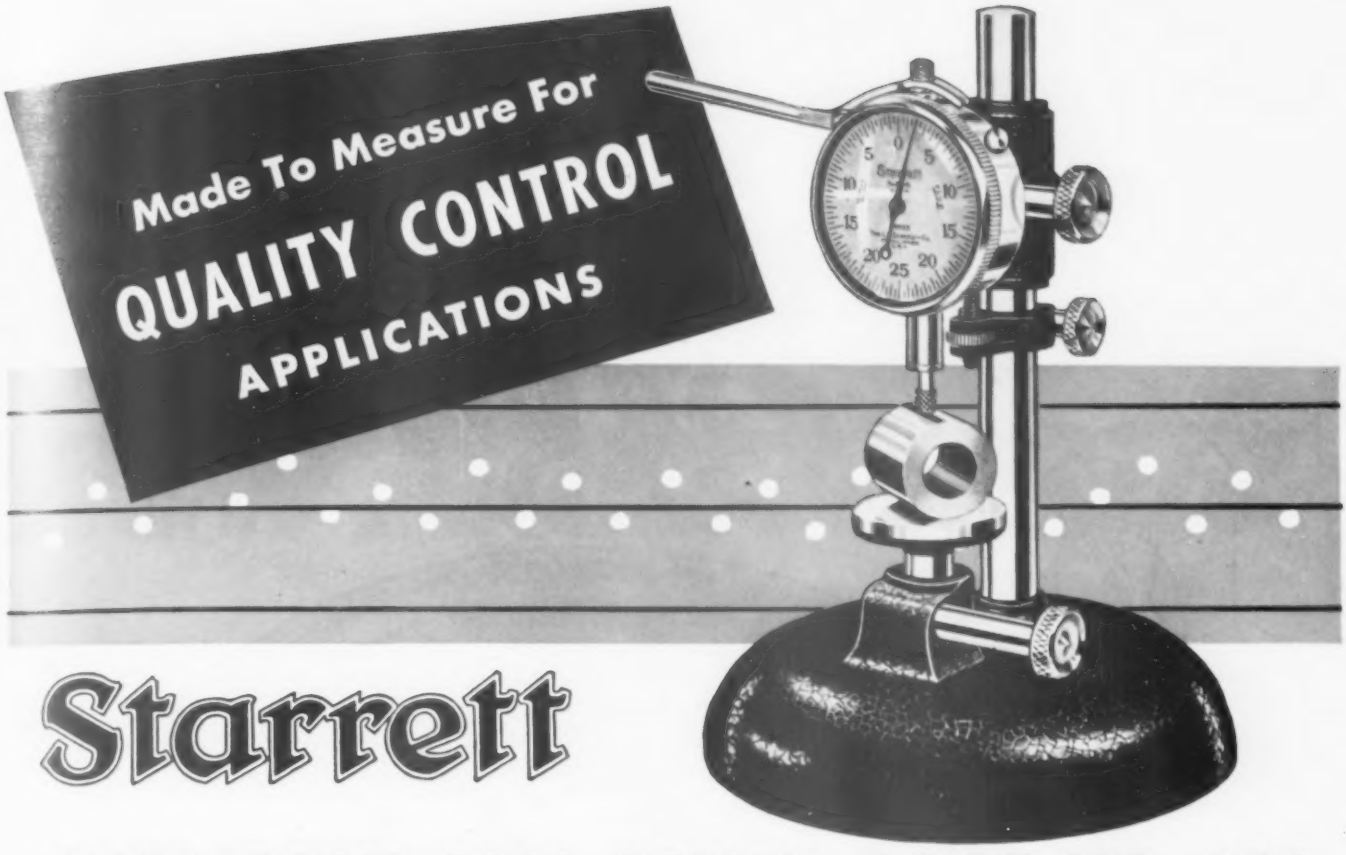

INSPECTOR'S DIAL BENCH GAGE NO. 654

Among the many outstanding applications of Starrett Dial Indicators to quality control procedures, Starrett No. 654 Dial Bench Gage offers many advantages. The adjustable table and lateral and fine perpendicular adjustment of the sliding head provides the flexibility needed for rapid adaptability to a wide range of applications.

Any style of indicator can be furnished. When equipped with Starrett Indicator No. 25-T5 (0-5-0, reading .0001") fitted with tell-tale hand and top lift lever, the maximum in speed, accuracy and convenience is provided for taking close measurements on a series of work pieces. Starrett No. 25-T1 is another popular indicator widely used for this application.

For a complete description of Starrett Dial Bench Gage No. 654 and the many Starrett Dial Indicators for quality control, see Starrett Dial Indicator Catalog "E". Write for a copy.

Starrett No. 25-T-1 Dial Indicator

Reads 0-5-0 by ten-thousandths, range .025. Can be furnished with tolerance hands to show plus and minus limits.

Starrett No. 25-T5 Dial Indicator

A long range indicator reading 050, graduated .001", range .200", with double dial and tell-tale hand.

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Starrett
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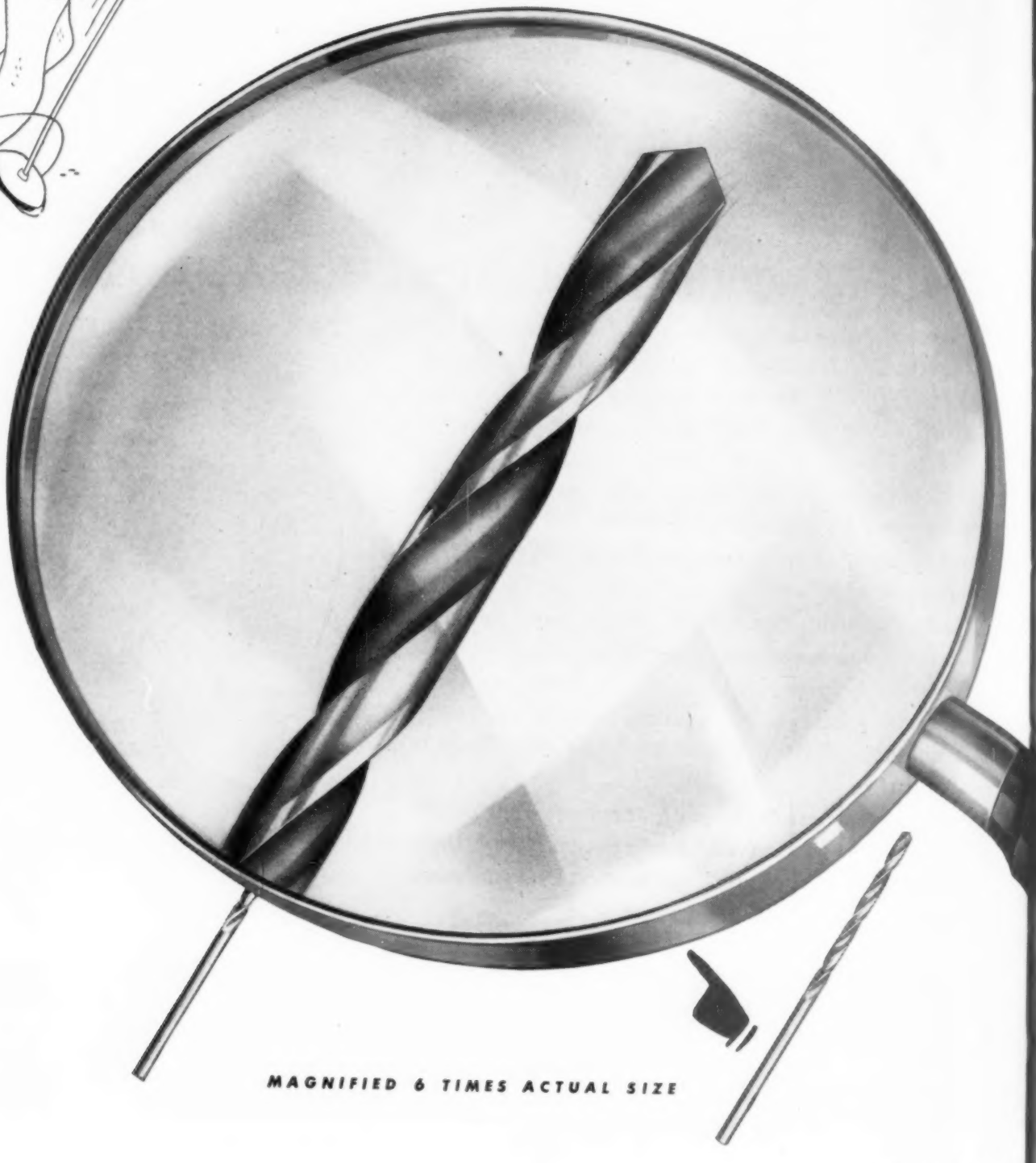
Announcing Big MORSE Cash Contest!



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$1,000.00 PRIZE

FOR THE BEST NAME for this NEW MORSE DRILL

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First Prize	$1,000.00 cash
Second Prize	$200.00 cash
Third Prize	$50.00 cash
Fourth Prize	Set of 4 dozen drills, any size you want.
Fifth Prize	Set of 2 dozen drills, any size you want.
Sixth Prize	Set of 1 dozen drills, any size you want.

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TERMS OF THE CONTEST

1. This contest does not cost you a cent, nothing but a little time and thought. No forms to fill out, either. Just typewrite your suggestions on a sheet of white paper the size of this page (smaller sizes might get lost) and write your name and address.
2. There's no limit to the number of names you can send in.
3. Any person residing in the continental U.S. may submit entries—except employees and the families of employees of Morse Twist Drill & Machine Co., and its advertising agency.
4. In case of duplication of winning name, duplicate prizes will be awarded.
5. No entries can be returned, and all entries become the sole property of Morse Twist Drill & Machine Co.
6. Entries must be postmarked not later than midnight, March 15, 1949.
7. The decision of the judges will be final.
8. *Address all entries to:* NEW NAME CONTEST, Morse Twist Drill & Machine Co., New Bedford, Mass.

WINNERS WILL BE ANNOUNCED IN THE MAY ISSUE OF THIS AND OTHER INDUSTRIAL MAGAZINES . . . WATCH FOR THEM!

FEATURES OF NEW MORSE DRILL: This new gold-colored Morse Drill delivers 50% more production, on multi-spindle automatic machines. This longer life comes from greater toughness and flexibility . . . and guarantees substantial savings because of far fewer drill-changeovers.

Here is a *completely new* drill . . . ground from the solid, with heavier web, increased twist, and wider flutes that clear chips through hole and jig bushing in a fast easy flow. *But here's the final payoff:* Morse has added something new to drill manufacture . . . *an extra, exclusive process* that gives this drill more strength *—more plain fighting guts to withstand higher speeds—* than any other drill. This has been proved by thorough field tests. 58 sizes, from No. 80 to ½", are now available through Morse-Franchised Distributors.

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Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

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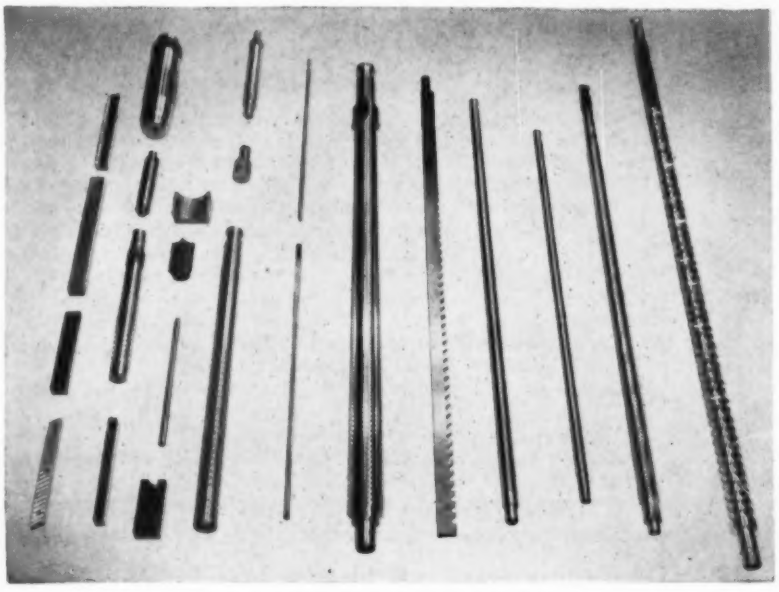

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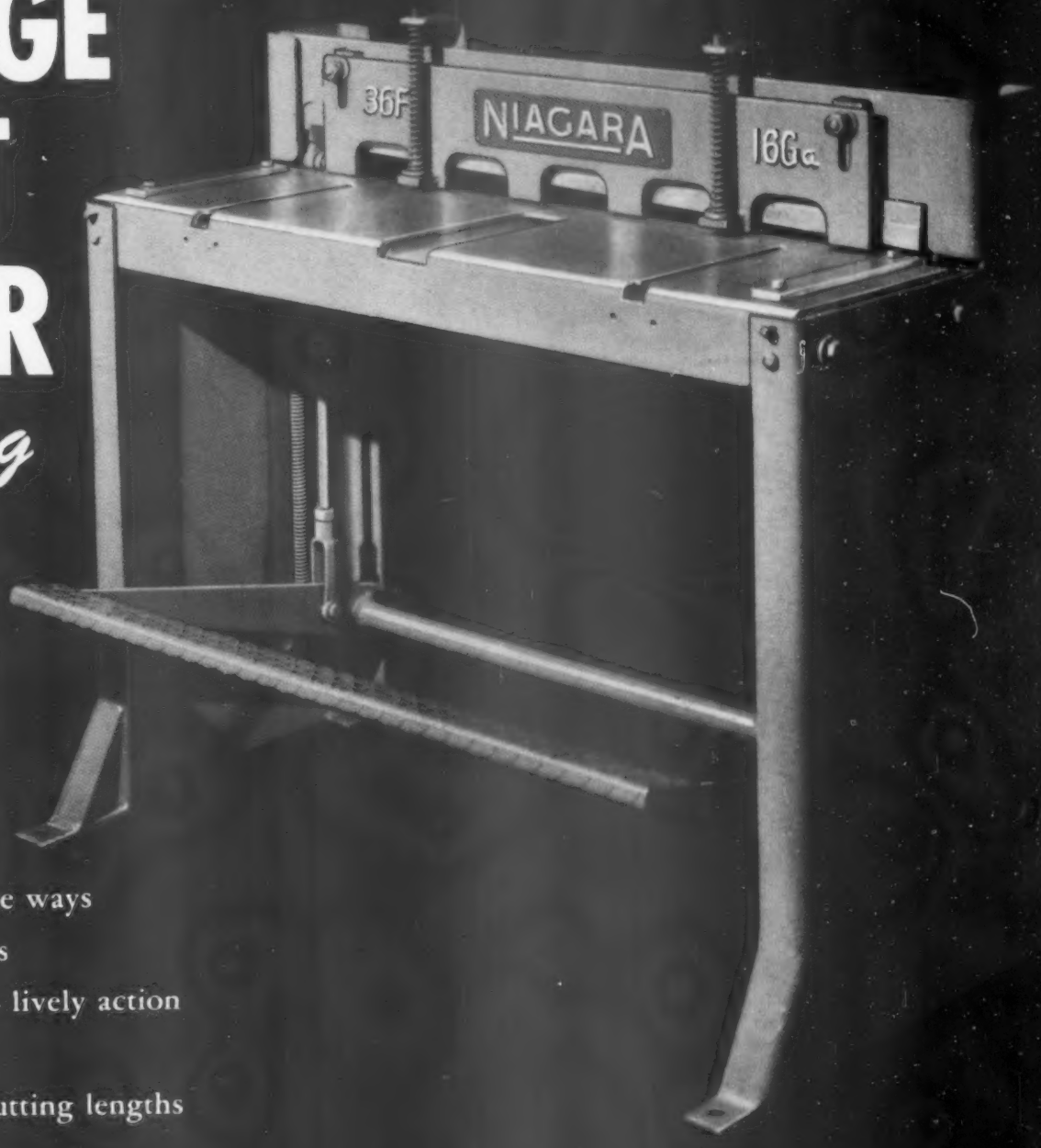

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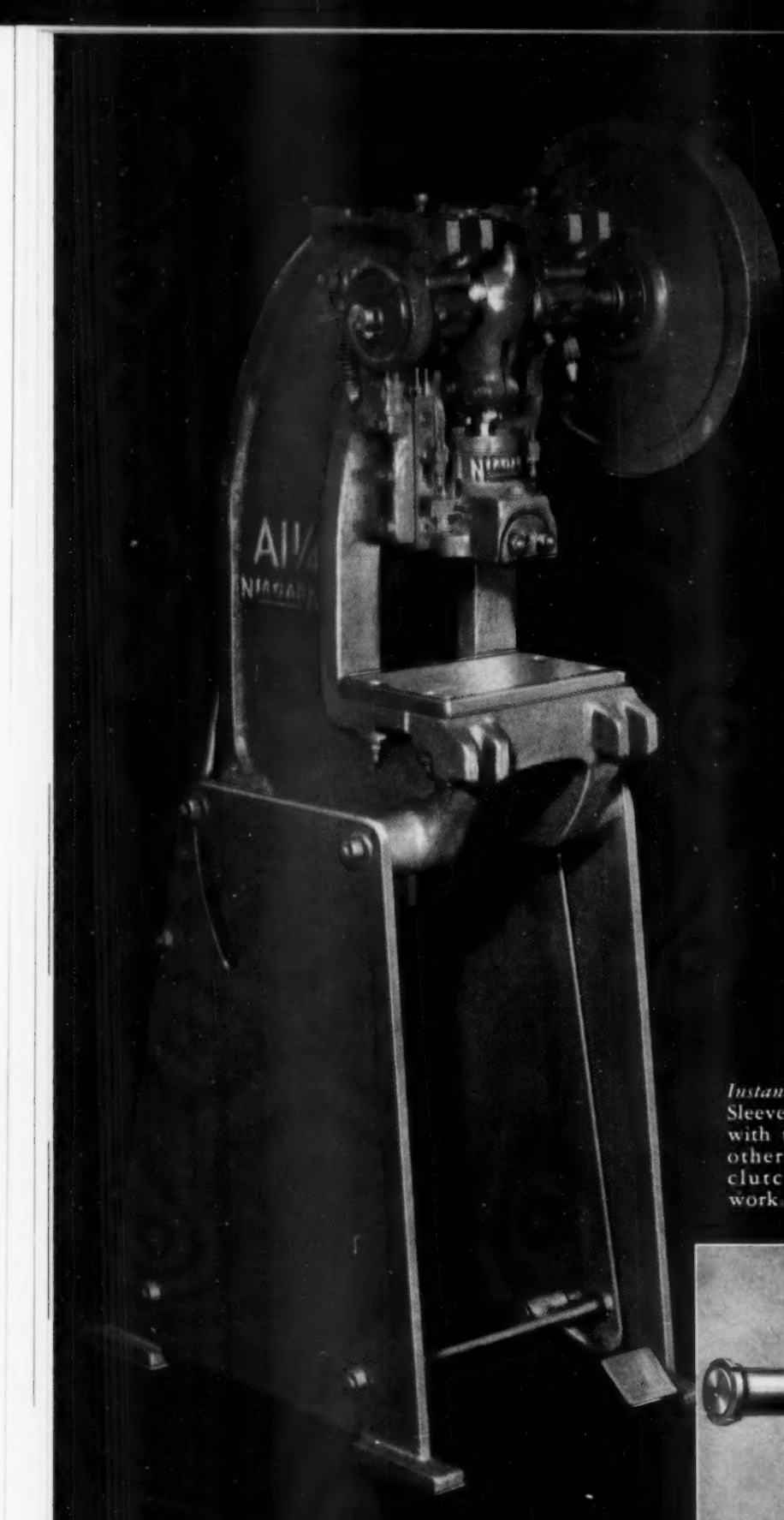

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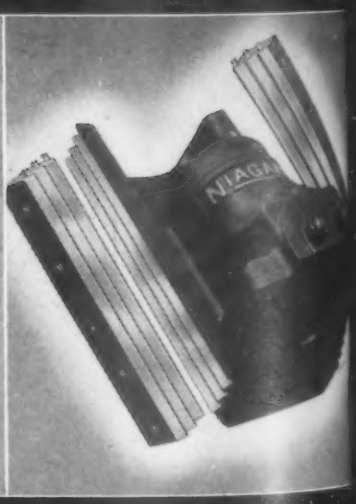

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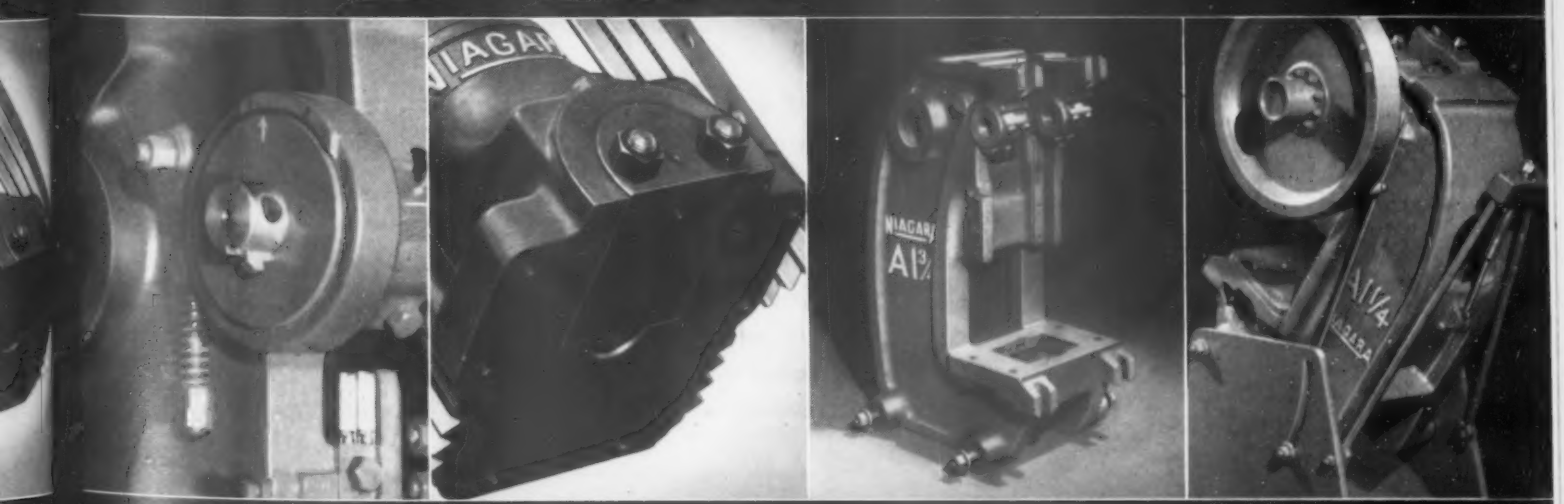

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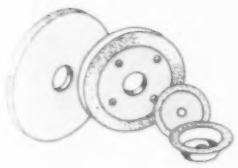


Developments in Carbide Grinding

by F. J. Benn
GRINDING ENGINEER
NORTON COMPANY

THE DEVELOPMENT of cemented carbides and abrasive products necessary for their final processing and maintenance have of necessity gone hand in hand. In many instances, advances toward better grinding wheels and operating techniques have permitted the use of carbides on applications which had previously been considered unfeasible because of cost considerations. Thus there is an inter-relationship between the two products, both of which play important roles in a wide range of material processing fields.

A glance at the accompanying chart, Fig. 1, will indicate the relative hardness values of the various materials under consideration. Here we see conclusively that natural diamond abrasive is, by far, the hardest material that can be used as a grinding medium. In addition to its extreme hardness, the diamond has other inherent characteristics which make it a still more suitable material for grinding hard substances such as cemented carbides. There are definite considerations that must be taken into account, however, if economical use of relatively expensive diamond abrasive wheels is to be obtained. The various types of diamond wheels available, and the fact that in some instances low priced silicon carbide wheels can be used advantageously, indicates that definite evaluation is necessary to obtain optimum grinding wheel selection. In the case of diamond wheels, for example, a single change in bond type, grit size, hardness grade, or diamond concentration can spell the difference between profit and loss in the manufacture or use of cemented carbide cutting tools or other products. It is the purpose of this article to point out these considerations in the light of latest diamond wheel developments and recent test data so that maximum economy both with regard to wheel expense and grinding time may be realized.

Referring again to the material hardness chart, we see that boron carbide ranks high on the scale; however, its fracture characteristics do not permit effective use as an abrasive element in a bonded grinding wheel. Boron carbide, however, does have a definite place as a loose abrasive lapping material. We also see that certain types of friable aluminum oxide abrasives are in themselves harder than cemented carbide but not as hard as the actual carbide particles themselves. In certain grades of cemented carbides containing high percentages of binder the use of aluminum oxide wheels is possible although not usually recommended. Experience has shown the advantages of the use of both diamond and silicon carbide abrasive wheels for cemented carbide grinding. Definite information as to the selection of each for particular jobs is available and can be substantiated by considerable test data.

Use of Silicon Carbide Wheels

In general, silicon carbide wheels should be restricted to operations where the following conditions prevail:

1. Large amounts of carbide have to be removed.
2. Considerable amounts of shank steel have to be inadvertently ground as may occur in roughing single-point tools or certain types of milling cutters.

As roughing operations constitute a major portion of the above two conditions, most silicon carbide wheels are supplied in 60 grit size. Coarser grits are not recommended but finer wheels can be used, depending upon individual finish requirements. In some cases, a secondary or semi-finishing operation is performed, using 100 or 120 grit wheels. Relatively soft grades such as I or J are necessary as the abrasive grains dull rapidly and must be released from the body rather quickly to maintain good cutting action and prevent overheating of the work.

The choice of green or regular black silicon carbide abrasive appears to be a matter of consumer preference and no conclusive evidence can be established as to the superiority of one type over the other. In most practices, green wheels are preferrd.

Little can be said as to the choice between so-called regular and open or porous structure wheels. For extremely large tools the porous structure type has the advantage of faster

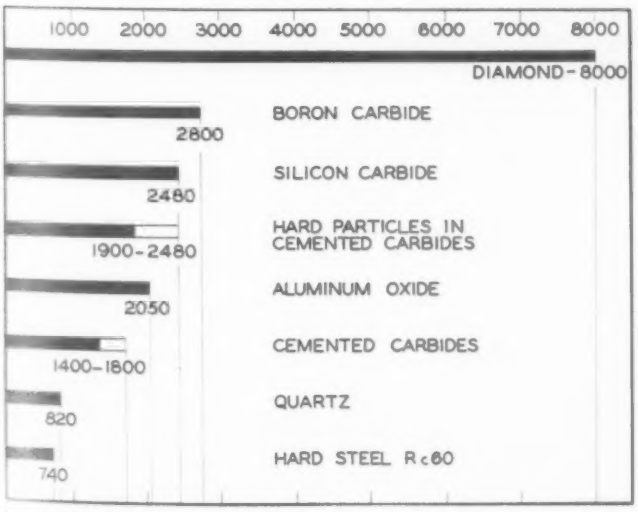


Fig. 1. Relative hardness values of steel, carbides and abrasives.

BOND TYPE AND CHARACTERISTICS	AVAILABLE GRADES	APPLICATION
Resinoid	H,J,L,N,R	Offhand
Fastest Cut, Shortest Life		Fixed Feed Surface, Chipbreaker, Tool and Cutter, Cylindrical, Form, Internal, Thread Centerless
Metal	N	Offhand
Slowest Cut, Longest Life	L (Cut-off Wheels Only)	Fixed Feed Cut-off, Chipbreaker,
Vitrified	J,L,N,P,R	Offhand
Fast Cut, Long Life		Fixed Feed Surface, Internal, Cylindrical, Chipbreaker

Fig. 2. Applications, characteristics and available grades of diamond wheels.

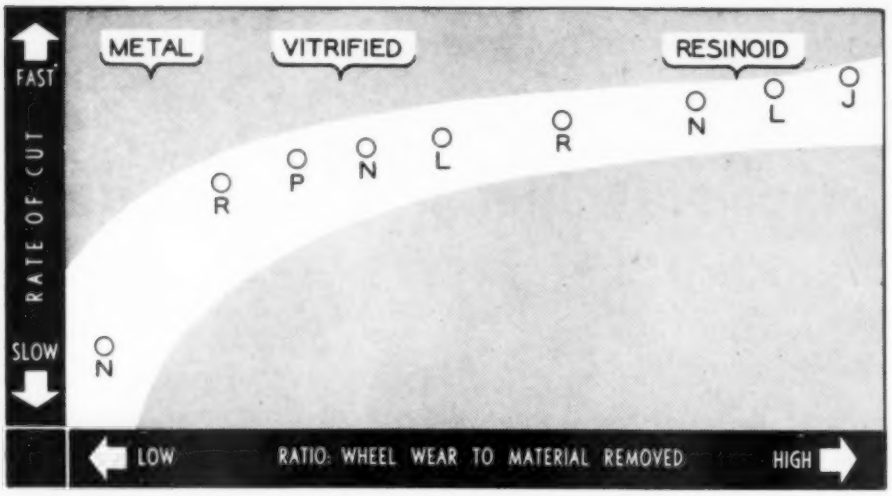


Fig. 3. This chart on offhand grinding shows the ratio of wheel wear to material removed and the rate of cut for diamond wheel bonds and grades.

Specification	Wheel Cost (cents) per unit ground
D180—J100B1/8	16.0
D180—J50B1/8	15.3
D180—N50B1/8	6.4
D180—R50B1/8	4.3
D220—L50V1/8	3.2
D220—N50V1/8	2.1
D220—P50V1/8	1.4
D220—R50V1/8	1.0
D120—N50M1/8	.6

Fig. 4. Comparison of wheel costs of various grades on offhand grinding.

cutting action, while on small parts the regular structure product offers more resistance to grooving and resultant rapid wear.

On fixed feed grinding operations difficulty is often experienced with silicon carbide wheels as their rapid wearing characteristics requires almost continuuos machine adjustment to maintain accurate sizing. Again, where large amounts of stock must be removed and steel is encountered, a preliminary roughing operation followed by final grinding with a diamond wheel is recommended.

An often neglected but very important detail is the desirability of frequent dressing with a star type dresser. For rapid cutting action a somewhat rough wheel face is desirable and can be easily obtained with this type of tool. When diamond truing tools of various styles are used, care must be taken to prevent the development of too smooth a wheel face.

Selection of Diamond Wheels

The selection of diamond wheels presents a more complex problem as a variety of specifications are usuable with more or less satisfactory results. Because of the relatively high initial cost of diamond wheels, small variations in performance caused by poor selection have a great effect upon grinding costs. It is thus extremely important to consider all influencing factors to make sure that the best type and specifications of diamond wheel are specified for each application.

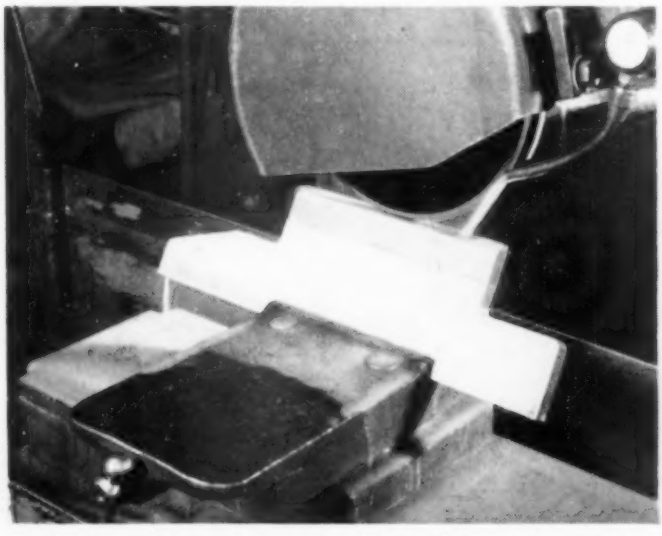
The first variable that should be considered is the bond type. This is basic and determines the ultimate choice of all other variables such as grit size, hardness grade and diamond concentration. The table shown in Fig. 2 indicates the general characteristics of the three bond types, as well as the application of each bond for specific operations.

Thus, we see that the vitrified bonded diamond wheel combines the fast cutting characteristics of the resinoid bonded type and the long life, durable qualities of the metal bonded type. More specific information on the relative performance of each bond for particular operations is presented in succeeding paragraphs.

The second variable that should be considered in diamond wheel selection is the grade of hardness or degree of holding power between the bonding matrix and the individual diamond cutting points. Available grades in each bond in the order of increasing hardness are as shown in Fig. 2.

Recent information and industry trends indicate that wheels in the harder grade ranges and more durable bonds are advisable in many applications. When, for example, resinoid bonded diamond wheels were first introduced, grade J only was available. In the natural course of diamond wheel developments, harder grades became available. However, many consumers through force of habit continued to use the original relatively soft grade wheels, overlooking the benefits that could be obtained through the use of harder and more durable wheels. The introduction of the metal and vitrified bonded lines also presented a similar problem.

To demonstrate differences in action and wheel expense per unit of carbide ground for the various bonds and grades, particular operations must be considered as individual results are obtained for each.



Resurfacing a carbide-tipped centerless grinder work blade rising a 220 grit diamond wheel.

Typical cutter grinding setup using resinoid bonded cup type wheel. Here operator is cleaning wheel face with lump of pumice.

Specification	Wheel Cost per cu. in. ground
D120—J100B1/8	$15.00
D120—N50B1/8	10.00
D120—N100B1/8	8.32
D150—N100V1/8	2.25
D150—N50V1/8	3.31

Fig. 5. Comparison of cylindrical grinding costs, showing results with resinoid and vitrified bonds, and the effect of diamond concentration.

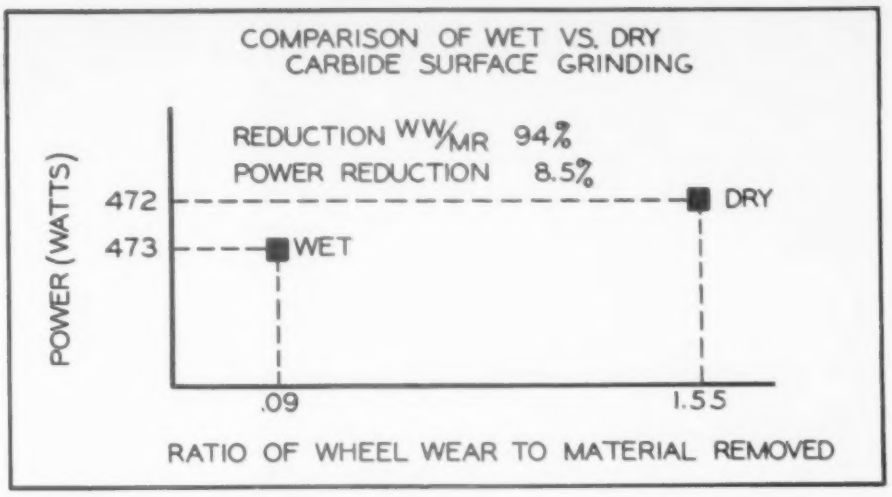


Fig. 6. Comparison of wet vs. dry carbide surface grinding, showing power consumed and ratio of wheel wear to material removed.

Offhand Grinding

The relationship of grinding costs between resinoid, vitrified and metal bonded diamond wheels in the hardness grades indicated is shown in Fig. 3. The significance of these data lies in the wide variation along the horizontal or ratio of wheel wear to material removed scale accompanied by the relatively small differences occuring in the vertical or rate of cut ordinate. Thus, we see immediately the cost advantages that can be realized in offhand grinding by:

1. Using only vitrified or metal bonded diamond wheels.
2. Using harder grades such as P or R in the vitrified group.

It is strongly advised that the choice of resinoid bonded wheels for offhand grinding be made only in rare instances such as the use of very fine grit sizes for extremely fine finishes. This recommendation can be emphasized by considering data presented in Fig. 4, a tabulation of wheel costs per unit of carbide ground for various wheel specifications. These data are based on actual test results obtained from field and laboratory reports.

The costs shown clearly indicate the savings that can be expected in converting from resinoid to either vitrified or metal bond. With cost advantages of 16 to 1 possible with little or no sacrifice in cutting action, there should be no doubt as to the type of diamond wheel best suited for offhand grinding of cemented carbides.

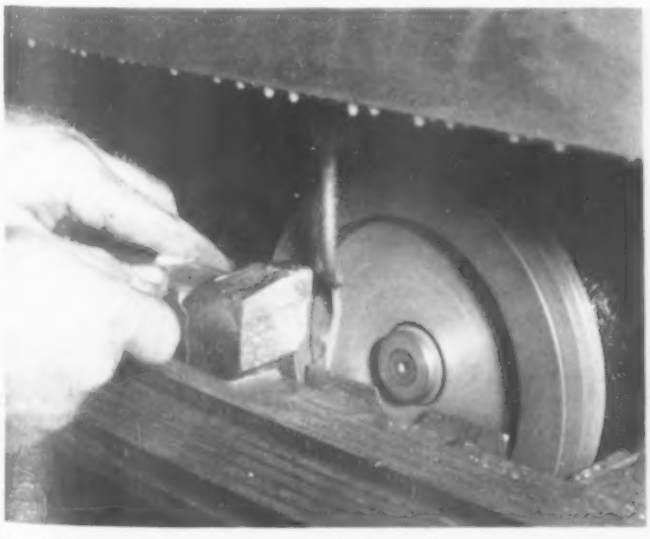
With the introduction of carbides on such jobs as lamination dies, wire forming rolls, steel mill rolls, gages, etc., cylindrical grinding has become increasingly important. As in other cases, grade J resinoid bonded diamond wheels were first used for this application. A cost comparison between grades of resinoid and vitrified bonded wheels is shown in Fig. 5. Note also the effect of diamond concentration. Here we see that 100 concentration wheels give a definite advantage over 50 concentration.

A word of caution should be introduced regarding the use of vitrified bonded diamond wheels on cylindrical work. Rather high pressures are built up between the wheel and work, and parts with a high slenderness ratio of length to diameter have a tendency to spring. Only work of a sturdy nature should be ground with the vitrified bonded type of diamond wheel.

Surface Grinding

The trend towards wider application of carbides to wear-resistant parts is reflected in the increased use of peripheral type diamond wheels for use on surface grinding operations. Here again harder grade resinoid bonded wheels, and vitrified wheels on wet operations, are proving to be of advantage in reducing grinding costs. A further consideration of wet versus dry grinding in this classification is given under "coolants."

It is not within the scope of this article to discuss all of the various types of carbide grinding operations in detail. To cover the most common operations such as chip breaker, surfacing, internal, and tool and cutter grinding (involving diamond wheel shapes D11B, D12W, D12WV1 and D15W) a table of wheel recommendations is offered.



Offhand grinding on cup type diamond wheel. Note direction of coolant flow against inside rim.

Silicon carbide wheel for offhand roughing. Crowning the rim of the wheel and dressing it roughly with a star dresser will speed up the cutting action.

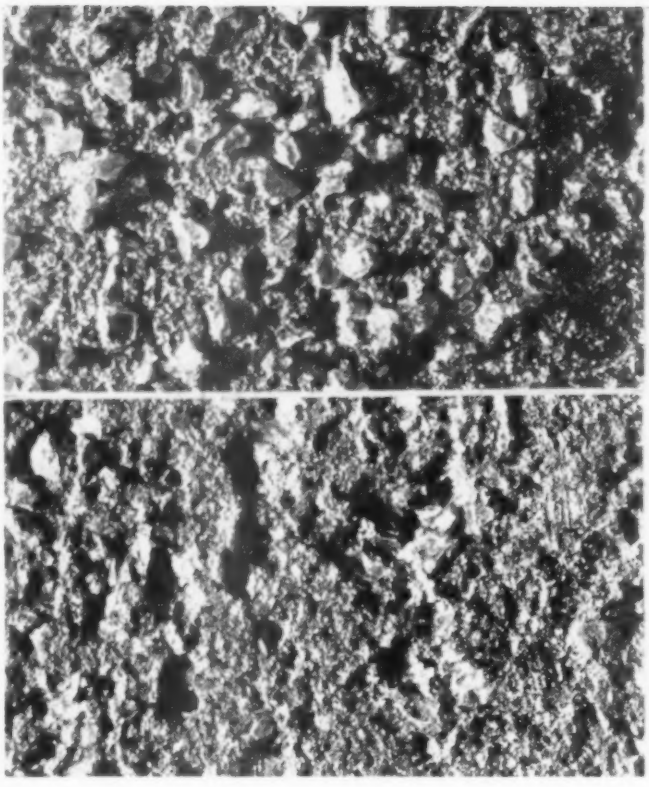
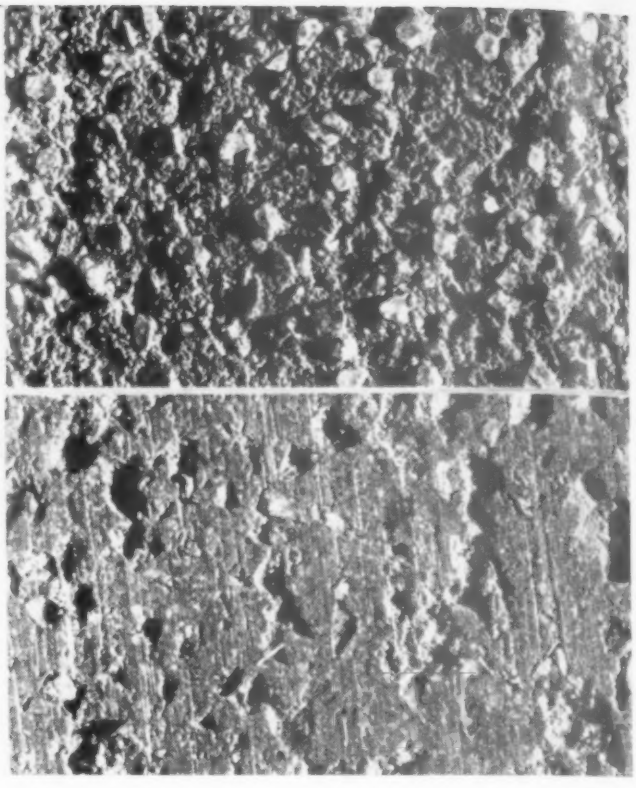


Fig. 7. (Top) Vitrified cup wheel face in new or freshly lapped condition. Note projecting diamonds.

(Bottom) Same face after 50 minutes of carbide grinding. Note diamonds still projecting although dulled.



(Top) Resinoid cup wheel face in new or freshly lapped condition. Note deeper set of diamonds.

(Bottom) Same face after 50 minutes of carbide grinding. Note absence of diamonds and large bond area.

Diamond Concentration

Concentration refers to the volume percent of diamond in the diamond section of the wheel or hone. A graphical illustration of the relative abrasive spacing for 100, 50 and 25 concentrations is shown on page 21.

A good general rule to follow is to select 100 concentration wheels for fixed feed operations and 50 concentration for offhand grinding, regardless of the bond type. Reference to page 21 will show the relative cost advantage of 100 concentrations over 50 concentration wheels on fixed feed applications.

Grade for grade, diamond wheels in each of the three bond types tend to act harder as the grit size becomes coarser; therefore, the coarsest grit size commensurate with the finish desired should be used in all cases.

Where resinoid bonded diamond wheels have been used on offhand grinding, in order to obtain the same surface finish and keenness of edge, as a rule, it is necessary to go one grit size *finer* in vitrified bond and one grit size *coarser* in metal bond. Fig. 6 shows the range of standard diamond grit sizes commonly used for carbide grinding and the general application of each.

In addition to the savings that can be realized through the proper selection of diamond wheels, additional advantages of great importance are possible if certain operating conditions are observed. One of the most important and unfortunately one of the most neglected of these is the use of coolants. An increase in wheel life of as high as 40 percent has been obtained with the same wheel used wet instead of dry. Also, harder grade wheels can be used on many operations, providing greater wheel economy.

Overheating from dry grinding causes resinoid bonded diamond wheels to char, crack and wear rapidly. Metal or vitrified wheels if used dry, tend to glaze and require much more frequent dressing to maintain their cutting ability.

Coolants such as plain water, soluble oil mixtures (80 to 1), mineral seal oil and kerosene are all satisfactory for use with diamond wheels.

Fig. 7 shows the results of a typical laboratory test on wet versus dry surface grinding.

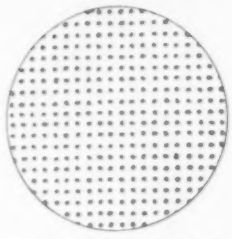
Dressing of Diamond Wheels

Occasionally, complaints are received that vitrified and metal bonded diamond wheels tend to glaze and stop cutting. Invariably, lack of proper stick-dressing is the only trouble. Vitrified and metal bonded wheels should be cleaned or dressed frequently with an abrasive stick similar to the one packed with the wheel by most suppliers. Specific information as to the best abrasive stick specifications to use on various types of diamond wheels can be obtained from the manufacturer.

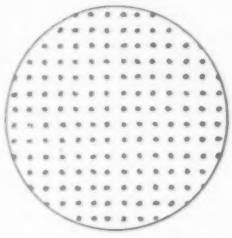
On metal and vitrified bonded wheels, dressing should be done vigorously as it definitely will not injure the wheel surface in any way. As much as ¼ in. to ⅜ in. should be worn from a ½ in. square abrasive stick per dressing for effective results. This is very important as too little or too infrequent dressing will only mean that the wheel eventually must be dismounted and lapped with loose abrasive—a more or less wasteful and time-consuming procedure.

The foregoing considerations apply to metal and vitrified diamond wheels only. Resinoid bonded wheels should occasionally be dressed or rather cleaned with nothing harsher than lump pumice or a very fine and soft abrasive stick.

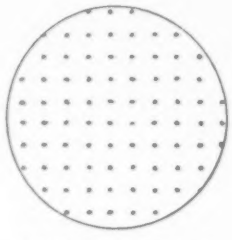
To illustrate the condition of a diamond wheel face in a new or freshly lapped condition and the effects of continued grinding without dressing, laboratory photomicrographs are shown in Fig 10. Here we see the face condition of a new vitrified bonded cup wheel and the same area after 50 minutes of carbide grinding. The same conditions are shown for a similar resinoid bonded wheels. These prints prove also the advantage of using vitrified bonded diamond wheels for offhand grinding operations. Note particularly the large voids in the resinoid wheel caused by loss of useful diamond particles.



"100" Concentration



"50" Concentration



"25" Concentration

The drawings above illustrate the relative spacing or concentration of diamonds on grinding wheels.

80	Sometimes used for rapid rough grinding, offhand.
100	For rapid removal of stock, either offhand or machine grinding; also for cutting off. It is the most common roughing grit size in all diamond wheel shapes.
100S	(This size may be considered intermediate between 100 and 120.) For rough grinding, where 100 grit may be too coarse. For cutting off.
120 } 150	For resharpening, offhand, steel-cutting grades of single-point roughing tools. For combination roughing and finishing wheel on offhand grinding single-point tools. For cutting off and grooving. For chip breaker grinding.
180	Widely used for tool and cutter work with flowing cup and disk wheels.
220 } 240	For finish grinding all types of tools, either offhand or machine grinding. For cylindrical, surface and internal grinding to a fine finish.
320 } 400	For very fine finishing, especially boring tools. For hand hones.
500	For lapping extremely keen edges with resinoid bonded wheels, as sometimes required for certain boring tools. For mirror finish on carbide tools, gages, etc.

Diamond grit sizes commonly used on carbide grinding applications.

Table of Wheel Recommendations

Offhand grinding	
Roughing	39C601-I7V Silicon Carbide Vitrified
Semi-finishing	39C100-H7V Silicon Carbide Vitrified
Offhand Grinding—Cup Wheels	D100-P50V (fastest cut) or
Roughing (wet)	D100-R50V (lowest grinding cost) or D100-N50M (slower cut, longest life)
Finishing (wet)	D220-P50V (fastest cut) or D220-R50V (lowest grinding cost) or D220-N50M (slower cut, longest life)
Combination roughing and finishing (wet)	D150-P50V (fastest cut) or D120-R50V (lowest grinding cost) or D120-N50 M (slower cut, longest life)

Precision Grinding

Type D11B (Flaring cup wheels)

Use resinoid type bond, 100 concentration, grade N. in coarsest grit size commensurate with finish desired.

Roughing	D-100-N100B
Finishing	D180-N100B
Combination rough and finish grinding	D150-N100B

Type D1T (Straight wheels)

1. Surface Grinding (dry)	
Roughing	D100-J100B
Finishing	D150-J100B to D400-J100B (depending upon finish desired)
2. Surface Grinding (wet)	
Roughing	D100-N100B or D100-L100V
Finishing	D150-N100B to D400-N100 B or D180-L100V to D400-L100V (depending upon finish desired)
3. Cylindrical Grinding (wet)	
Roughing	D100-N100B
Finishing	D150-N100B to D400-N100B (depending upon finish desired)
4. Chip Breaker Grinding	D100S or D150-R100B (wheels thinner than ¼") D150 or D220-N100V (wheels ¼" thick)
5. Internal Grinding	D100 to D400-L100V (depending on finish desired) or D100 to D400-L100B (depending on finish desired)

Types D12, D12WVI and D15W—Dish Wheels

Roughing	D100-L100B
Finishing	D180-L100B
Combination rough and finish grinding	D150-L100B

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Magazine Loading Speeds Gear Shaving

Magazine Feeding of Gears reduces Handling and boosts Hourly Output

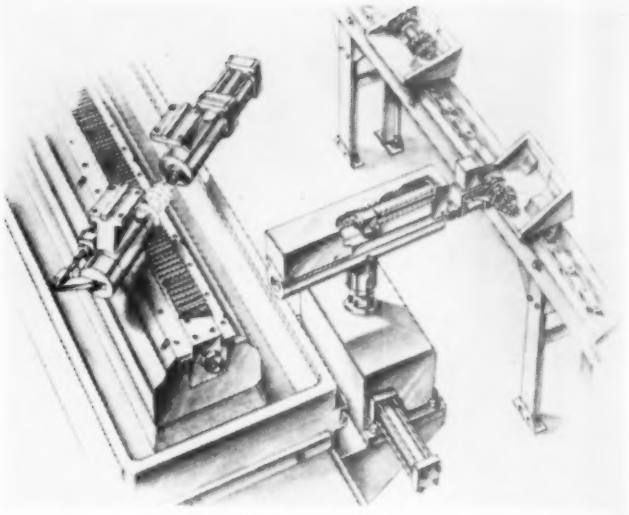


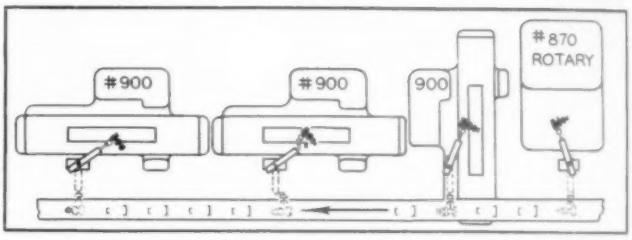
Fig. 1. Jaw-type loader, used to handle cluster gears from conveyor to machine and return. The jaw has two stationary lower fingers and one solenoid-retractable upper finger. To pick a gear off the conveyor, the jaw is moved toward the gear by a pneumatic cylinder. As the jaw closes, the cylinder reverses and the entire mechanism rotates to face the machine centers, into which the gear is loaded. The cycle repeats. While shown in connection with rack-type gear shaving machine, this loader can also be used with the rotary shaver, as suggested by Fig. 2, below, which shows a conveyorized installation on three racks and one underpass-type machine. Photo by courtesy of Michigan Tool Company, Detroit, Michigan.

AUTOMATIC LOADING and unloading of gears and pinions, at the Warner Gear Division of the Borg-Warner Corporation, has reduced operator effort and materially increased output per machine in the finishing of various types of transmission gears. In some of these installations, the gears are manually loaded into the magazines, from which they are automatically fed to and discharged from the shaving cutters. In others, as suggested by Fig. 1, gears are automatically picked from a moving conveyor and then loaded into the gear shaving machine. See Fig. 2 for layout of conveyor installation

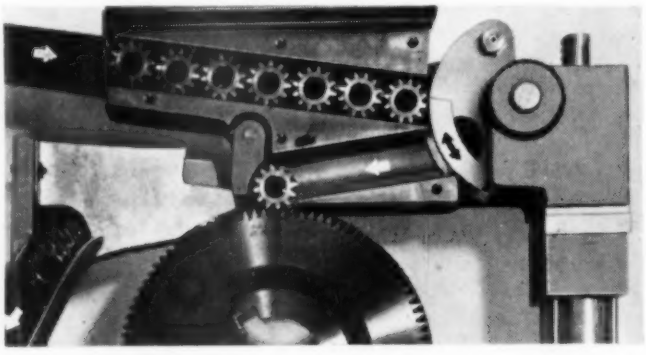
The gear shaving machines employed are the Red Ring rotary overpass, by National Broach and Machine Company, and the No. 900 Rack-type and No. 870 rotary underpass, by Michigan Tool Company, both of Detroit, Michigan. Both makes of machines incorporate automatically retractable centers. These, together with the automatic loaders, are synchronized with the machine cycle and are further electrically interlocked with the machine cycle to stop the machine in event that any part of the loading mechanism should fail to properly function.

While the automatic loaders and unloaders are largely similar in principle and operation, there is sufficient difference in detail to warrant separate descriptions. Especially so considering that this system of loading and unloading can be practically applied to a wide variety of machine operations and to various types of metal working equipment.

While ingenious, the loading devices developed for both makes of gear shavers are fundamentally simple and efficient. For example, the jaw-type leader shown in Fig. 1 is a highly co-ordinated unit that picks gears from a conveyor, loads them into the machine and, after shaving, returns them to the conveyor. The unit illustrated is set up to handle cluster gears. Because these must be loaded in proper end-for-end position, they are manually loaded into the conveyor carriers. The machine is a rack-type, although the loader will also serve a rotary machine.



In operation, the loader swivels through an arc or 135° approximately. The jaws, normally open or retracted, are pushed toward the gear on the conveyor by means of an air cylinder, then, having engaged the gear, automatically close.



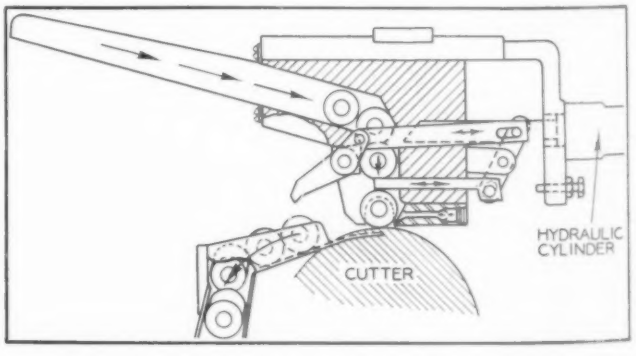
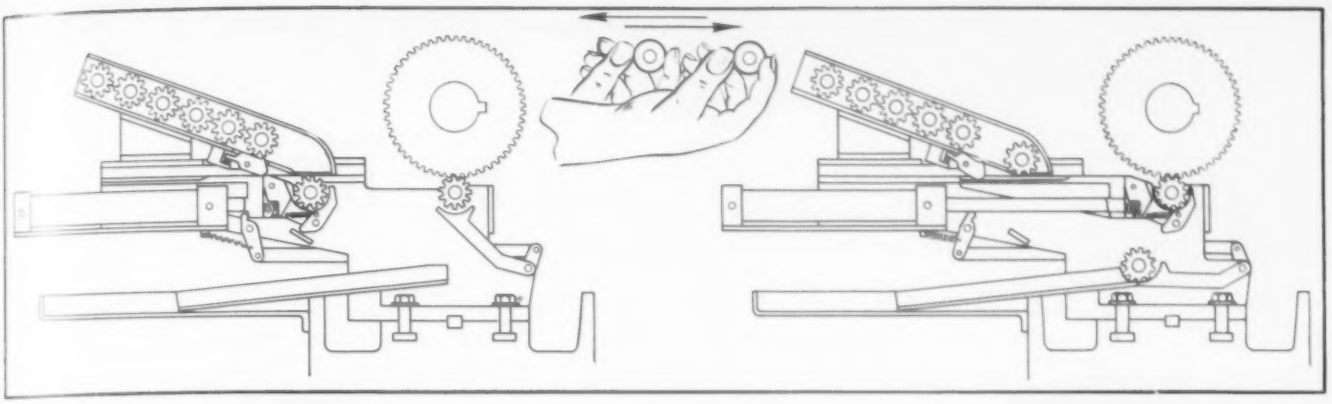


Fig. 3, at left. Cut-away view of gravity chute feed for rotary gear shaving machine. The pinions to be shaved are loaded into the upper chute, either manually or mechanically, and one gear at a time enters the shuttle rotor shown at right. The shuttle then "indexes" to the lower chute, blocking off the upper, when the pinion rolls into engagement with the shaving cutter. At this point, one center of the pneumatic headstock enters the bore with a slight press fit, thus serving as an arbor. The stationary center locates the pinion axially. At the end of the shaving cycle, the headstock center retracts, stripping the pinion which rolls down in the discharge chute. The loader immediately delivers another pinion to the cutter, and the cycle repeating ad infinitum. Photo by courtesy of Michigan Gear Company. Fig. 4, at right, a diagram of another gravity chute feed. This is similar to the one shown in Fig. 2 except that the gear is permitted to drop directly into position. A plunger enters above the gear being shaved and arrests the following gear. In addition to the locating finger, a wedge-shaped locator insures accurate positioning before the center enters the hub of the gear. Unloading is similar to that of the device shown in Fig. 2. Illustration by courtesy of Michigan Tool Company. The attachments, Figs. 1, 2, 3, 4, and 9 are all mounted on Michigan Tool Company Underpass type machines.



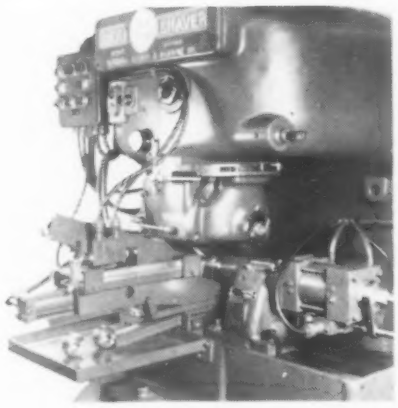
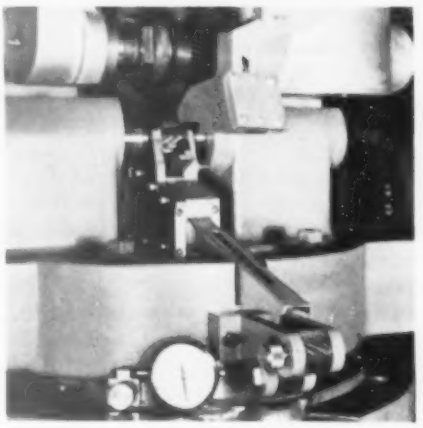


Fig. 5, above, a push-type fully automatic loading attachment for gear shaving machines as developed by National Broach and Machine Company, Detroit. The left-hand diagram shows Nos. 1 and 3 positions—that is, start and finish of loading stroke—and the right-hand diagram No. 2 position, with the gear pushed n place under the shaving cutter. Action can best be visualized by the movement of the hand, inset. A photograph of this loader, attached to a Red Ring Gear Shaver, is shown in Fig. 6 at left. Fig. 7, at right, shows a pull-type automatic loader. The gear shown is an overdrive transmission planet pinion having 12 teeth, 1 in. P.D. and 1 in. face. Actual shaving time is said to be 10 seconds, loading and unloading 2 seconds—a total of 12 seconds for the complete cycle. These illustrations by courtesy of National Broach and Machine Company, Detroit.



The unit then swings toward the machine, the jaws holding the gear in line with the automatically retracting machine centers. The centers advance and engage the gear, the machine goes through the shaving cycle and the jaws then return the shaved gear to the conveyor.

Figs. 3 and 4 show gravity-type loaders, both similar in principle but differing in mechanical details. The device in Fig. 3 employs a rotary shuttle to select the gears. In the "up" position, the gears roll into the shuttle from the upper chute, and drop into the lower chute in the "down" position. A finger arrests the gear to be shaved in proper relation to the cutter, then, as soon as shaving is completed, releases the gear for discharge into the exit chute.

The loader shown in Fig. 4 is also gravity fed, the main difference being that it employs a plunger to select and position the gears. In both loaders, the mechanism is actuated by hydraulic cylinders. The loaders described above are by Michigan Tool.

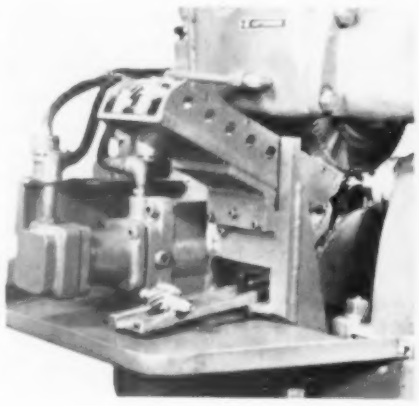
Fig. 5 is a schematic diagram of one of several National Broach and Machine units and illustrates the workings of a push-type loader. The gears rolling down the upper chute are arrested by a detent which, on retracting, permits one gear to fall into the loading jaw. This then advances the gear into position under the shaving cutter. On completing the shaving cycle, the gear drops into the discharge chute, the cycle repeating *ad infinitum*.

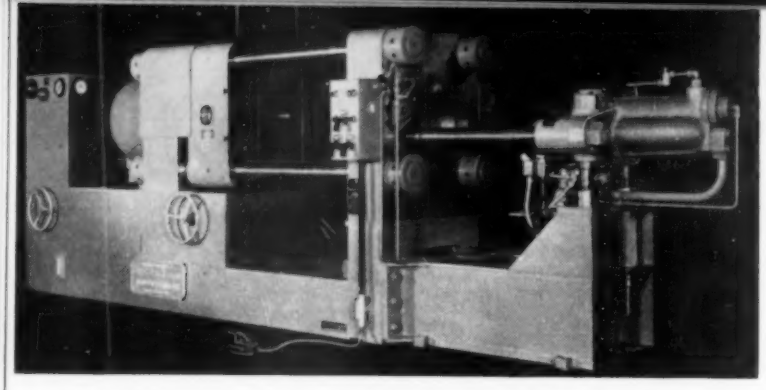
The drawing at left shows Nos. 1 and 3 positions—that is, start and return of the loading ram—while the illustration at right shows the gear engaged with the shaving cutter. Action may be compared to the gripping of a gear between the fingers and pushing it into position, as suggested by the hand, inset. A photograph of this leader, mounted on a Red Ring gear shaver, is shown in Fig. 6. National Broach also makes a full-type loader, shown in Fig. 7. The loaders described will take practically any type or size of gear, of which typical examples are shown in Fig. 8.

In addition to the loaders illustrated, both concerns have developed rotary index loaders, in which action is continuous in one direction. Michigan Tool has also incorporated a semi-automatic gaging device which pre-selects gears to be shaved and discards those gears which may have too much stock for best shaving results. See Fig. 9.

While actual production figures at Warner Gear are not disclosed, the potential output is high. For example, 12 tooth 13.5 D.P. pinions, 1 in. face, can be finished at the rate of about 300 per hour.

Fig. 8, at left, indicates the many types and sizes of gears which may be automatically loaded and unloaded. Photo by courtesy of National Broach & Machine Company. Fig. 9, at right, a semi-automatic gaging device, by Michigan Tool Company, which may be used in combination with automatic loading and unloading of gear shaving machines. The device is mounted at the loading end of the chute and consists of two gears, used to gage the pinions being finished, mounted so that they can revolve freely. Pinions with oversize pitch diameter, or with excessive stock that would preclude best shaving results, will not pass through to the shaving cutter.





Making the On Die Casting

By James L. Erickson
PRODUCTION DIE CAST COMPANY

THE NEWLY CONSTRUCTED, untried die casting die can be damaged during the initial trial as the result of any one of a number of factors. It may suffer damage as a result of (1) use of an unsatisfactory die steel; (2) improper heat treatment; (3) improper design; (4) failure of the die maker to make dimensional allowances for the thermal expansion of moving parts; (5) insufficient draft; (6) too quick heating of the die; (7) insufficient lubrication during the try-out period.

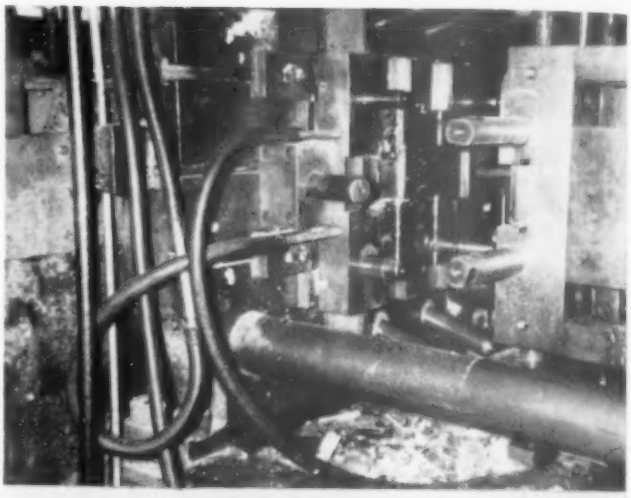
It is essential not only that die components be made of a satisfactory die steel, but in addition that the die steel be heat treated to the proper hardness. This is especially necessary for the steel that has been used to form the cores, stationary or removable. Frequently it is also wise to harden the die cavity inserts in cases where the die cavity is of such a design that it has a number of small cores or thin sections.

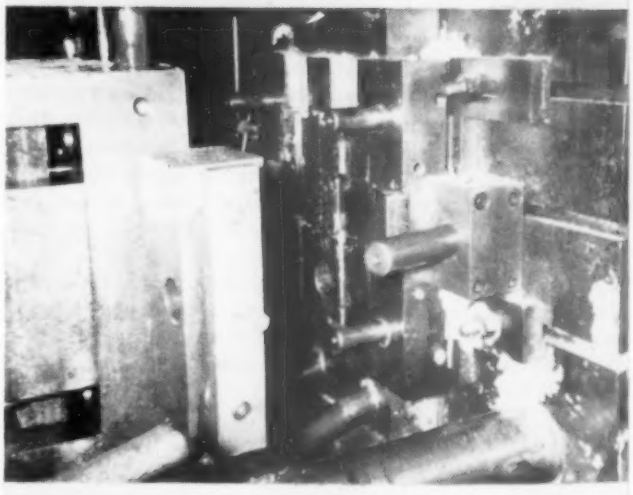
If the sliding cores, for example, are not hardened, they will tend to gall and seize during the trial run. Such an occurrence might seriously damage the die by causing jamming of the ejector block or possible shearing of the ejector pins.

The core pins and thin projecting sections of the die cavity should also be hardened prior to the trial run. This means that if these portions of the die cavity have been machined out of the die cavity itself, the entire block must be hardened. If these sections are not hardened, there is the distinct possibility that they will become damaged in one of the following ways: (1) the aluminum will seize to them, and when the casting is ejected from the die it will drag and gall, pulling them out of shape; (2) the incoming metal stream might impinge on them and literally bend them out of shape, further causing galling or dragging when the casting is ejected; (3) they become overheated and crack.

Following are a few die material prerequisites and hardness values which in general should be in effect when the die is given its trial run:

(1) Holding blocks should be NE8742, NE8745, or SAE 1045 forged steels, heat treated to 28-32 Rockwell C before machining.
(2) Die legs or parallels should be made from hot rolled steel (flame cut or sawed).
(3) Ejector plates should be made from CRS if standard sizes are available, or boiler plate.
(4) Angular core pull pins should be made of SAE 2345 or equivalent, hardened and drawn to 50-54 Rockwell C scale.
(5) Slides should be made of CRS, pack hardened.
(6) Cores not exceeding 1 in. diameter should be made of type 440 stainless, and heat treated as follows: Hardening: Immerse in cyanide bath (maintained at 45 percent sodium cyanide) at 1500-1550 deg F for ½-1





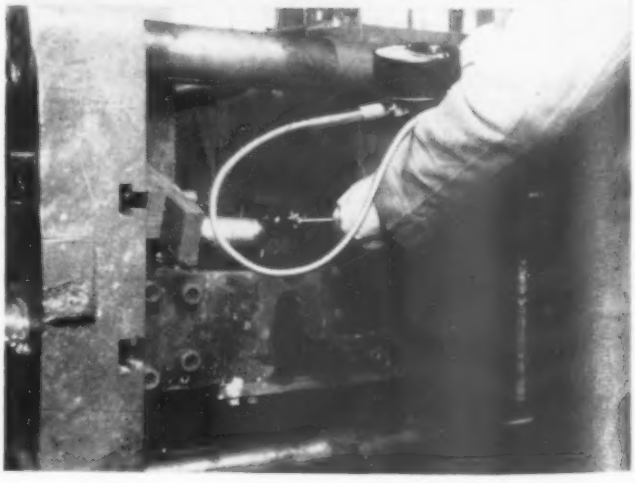


Fig. 1 A new die casting die photographed after the completion of its trial-run. View shows that portion of the die on the side of the machine away from the operator. The two die cavities in the stationary half of the die are visible.

Fig. 2. Same fishing handle die as shown in Fig. 1. The photograph of the die was taken from the operator's side of the machine. Note the flash caked about the die and the stationary platen.

Fig. 3. The trial-run operator stops his machine and checks to see if his die is up to temperature yet with the aid of an indicating type of hand-pyrometer.

Trial Run Dies

hr, depending upon the size of the core; then quenched in oil. The resulting case should be 0.005 in. min. Surface hardness should be 52 Rockwell C scale minimum.

(7) Large inserts, large cores and cavities should be made of Latrobe VDC, Braeburn Pressure Die No. 3, Crucible NU-die-V hardened to 444 Brinell, or similar.

The same die casting alloy should be used in the trial run of the die as will later be used for production, since the metallurgical behavior of the incorrect alloy might well be different from that of the correct alloy. Shrinkage varies among aluminum alloys, and therefore some tend to seize more tenaciously to the cores or thin sections of the die, or to shrink more between the projecting die sections. If an alloy is employed which has less shrinkage than the alloy specified by the customer, a true evaluation of the die cannot be made.

Another undesirable consequence of the use of incorrect alloy at the trial run is that a sound evaluation of the die's gating, venting, etc., in relation to the die casting quality cannot be made.

Check List for Design Features

A final check of overall design features of the dies is wise before the die is given its trial run. The following check list may be helpful.

(1) Vents present should be approximately 1 in. or wider and 0.005 to 0.010 in. in depth.

(2) The gate should be cut in from the runner end to the die cavity to a thickness of 0.040 in. max., depending upon nature and size of the cavity.

(3) In the case of multiple cavity dies, the size of the runners and gate must be equal.

(4) Runners and gates must be arranged for unrestricted metal flow. Changes in direction and "chocking" are to be avoided.

(5) Provision for water cooling must be made, particularly in the region of thick sections and near areas of heavy flow.

(6) Slides must have clearance which at minimum should not be less than 0.001 in. per in. and not more 0.002.

(7) Ejector pins must be loose laterally in the ejector plate, not vertically.

(8) All projecting cores, bosses and sections should be drafted at least one deg.

(9) Runners should be as highly polished as the die cavity.

After thorough checking, the die is mounted on the platens of the machine and is connected to suitable water lines. It is slowly heated by means of natural gas and air burners; oxyacetylene torches should never be employed.

As the die is being heated very slowly it should be opened and closed about once every two minutes and its moving components lubricated.

From the onset of the opening and closing of the die careful attention must be paid to the contacting surfaces of all moving parts of the die. At the first sign of a drag mark or a gall mark, the die should be immediately stopped and the necessary adjustment made.

DIE CASTING DIE LOG

X MANUFACTURING CO.

File No.:_____ Date: _____

Part Number:_____ Die Number:_____

Project Number:_____ Blueprint Number:_____

Die Casting Machine No.:_____ Operator:_____

Alloy:_____ Metal Grade:_____

Testing Directed by:_____

1. Metal Temperature in the Pot, °F.:_____
2. Die Temperature, cold half, °F.:_____
3. Die Temperature, hot half, °F.:_____
4. Pressure, psi.:_____
5. Plunger speed, ft/min.:_____
6. Locking pressure, psi.:_____
7. Length of the Butt, inc.:_____
8. Number of seconds between injection & opening the die:_____
9. Die Lubrication, where used:_____
10. Die Lubrication, type:_____
11. Die Lubrication, frequency of application:_____
12. Plunger dia., in.:_____
13. Plunger lubricant:_____
14. Water cooling:_____

_____

15. Source of heat on die:_____
16. Number of shots per minute:_____
17. Number of shots per hour:_____
18. Ladle size in. in diameter:_____
19. For every shots, ingots, lbs, have to be added to the furnace._____
20. Remarks and notes for future run:_____

Approved by:_____

Fig. 4. Typical "Logging" Chart for the trial-run. Once the new die casting die is found to produce die castings satisfactorily, all of the conditions of its successful operaton are logged on this sheet.

The die is continually opened and closed while the temperature of the die is being constantly increased. This enables any miscalculation on thermal expansion of the die parts to be caught just as the galling or seizing begins.

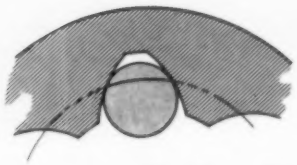
It is considered good practice to keep a periodic check on the surface temperature of the various die components during the warm-up interval. Temperatures may be checked accurately with a hand-type surface pyrometer, (Fig. 3).

During the warm-up period no molten metal is shot into the die. However, if the die continues to operate satisfactorily up to the desired temperature, then molten metal may be injected into the die—always a full shot. The first few shots should be made with sufficient metal to fill the die.

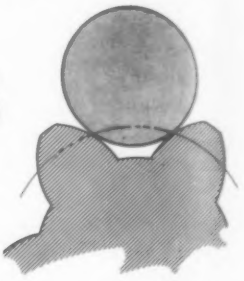
When these first "half shots" are made the die cavity face should be heavily swabbed with a suitable die lubricant.

The first complete die castings will be rather horrible looking externally, but they should be observed closely to see if they are hosts to any drag marks or are distorted due to uneven ejection. If there are no such defects or "danger" signs, additional metal is injected at more normal rates and under higher pressures. At this point the castings should fill out internally and the surface appearance should be improved; but excess die lubricant should still be used.

As the casting cycle progresses, the die lubricant should be gradually reduced in quantity. As this is done the castings should be observed for seizing or galling, as this tendency will increase as the lubricant is decreased.



Selection of Measuring Rolls for 30-Degree Involute Splines



By Joseph Silvagi

THE USE OF CYLINDRICAL measuring rolls for gaging gears and splines has been widely adopted because of the general simplicity and low cost of the method. Over-roll measurements used in determining tooth thickness give greater accuracy than vernier gear tooth calipers and somewhat the same accuracy as the costlier pressure angle blocks.

Determining the correct size of rolls to use for a given application is virtually as important as the measurement itself. Several methods are used to determine roll sizes:

a. "Spotting" various rolls on finished gear or spline.
b. Selection from an enlarged layout of the tooth space.
c. Direct calculation.

Method "a" requires, however, an almost-completed product to determine roll sizes. Thus the job may be held up while the over-roll measurements are being calculated. Method "b" involves a considerable amount of time. Method "c", which is both quick and accurate, can be done before manufacturing has begun.

In order to reduce calculations required, the graphs given here may simplify the roll selection for standard SAE or ASA (new standard) 30-deg involute splines. They are based on standard tooth and space widths and on the side-bearing, flat root series of splines. These have clearances at the major and minor diameters.

The minor and major TIF (true involute form) diameters referred to in Figs. 1 to 4 are the maximum and minimum diameters at which the roll may contact the involute profile. The fillets and chamfers at minor and major diameters determine these points.

The selection of measuring roll diameters for involute checking is based on several factors. Since tooth and space widths are measured at the pitch diameter, it is desirable to have a roll contact at that point. A roll at the major diameter would be acceptable except that the machine operator would not be certain of his profile until he reached the finished dimension. Until then, the roll would have edge contact with the major diameter (external splines) and therefore give false values. A roll is selected to contact slightly below the major TIF diameter, to avoid contacting the chamfer or fillet at the major diameter. Generally about 1/3 of the upper profile height below the major TIF is a good spot. All rolls that contact below the pitch diameter on these standard splines will require flats to avoid minor diameter imperfections. About half way between the pitch diameter and the minor TIF is a good spot for roll contact without at the same time requiring excessive flattening. The roll which contacts at the pitch diameter on external splines

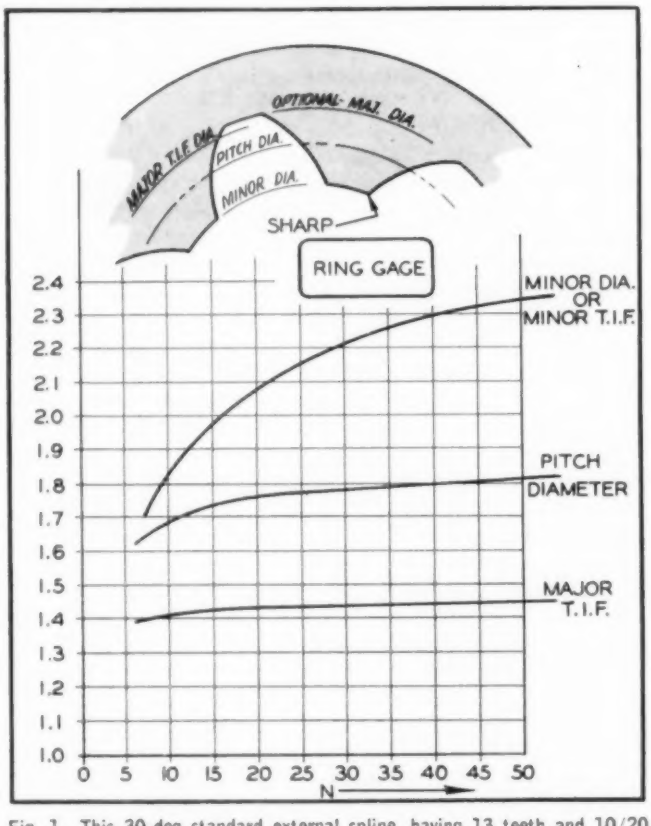


Fig. 1. This 30-deg standard external spline, having 13 teeth and 10/20 diametral pitch, is checked with three sets of measuring rolls. Diagram of the external spline is shown at upper right.

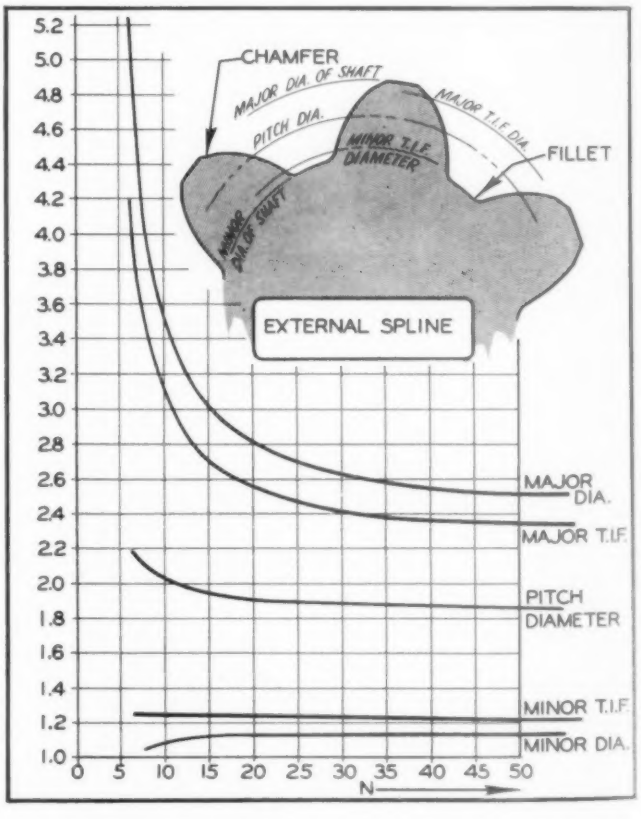


Fig. 2. The external spline profile is gaged by having the minor diameter of the ring form a sharp corner with the profiles.

will not require a flat to clear the minor diameter. Broaches must, however, have their minor diameters based on the minor diameters of the internal part. For this reason, rolls contacting at the pitch diameter must be flattened for the number of teeth below twenty (approx.).

A 30-deg standard external spline having 13 teeth and 10/20 D. P., as shown in Fig. 1, is to be checked with three sets of measuring rolls. It can be seen that, with 13 teeth, the roll which makes contact at the pitch diameter for 1 D. P. is 1.96. This figure is divided by the pitch to obtain the size required for the ten pitch spline; thus 1.96/10 equals 0.196. The nearest available roll size may be used; for example, 0.192 or 0.200. Next a roll is selected to contact at the upper part of the profile (about 1/3 down from the major TIF diameter). This is about 2.50 for a 1. D. P. spline and 0.250 for the ten pitch spline. In selecting a roll to contact on the lower portion of the tooth, a spot halfway between the pitch diameter and the minor TIF is chosen to avoid excessive flattening. This is 1.60 for a 1 D. P. spline, or 0.160 for a 10 D. P. spline.

Having selected the roll sizes, the customary calculation for over-roll measurements can be performed:

$$\text{Where } \frac{t}{d} + \theta_m + \frac{\text{Roll Diam.}}{D_b} - \frac{\pi}{N} = \text{Inv. } \phi_A = \theta_A$$

and "F" to roll center $= \dfrac{D_b}{2 \cos \phi_A}$ for external

For conditions where the tooth or space width is not standard, or for other than 30-deg splines, the equations in Table I may be used.

The accurate gaging of the external spline profile (Fig. 2) is best achieved by having the minor diameter of the ring form a sharp corner with the profiles. Thus, the ring gage diameter is also its minor TIF diameter and the minor TIF of the external part being gaged. In this manner the full involute profile is checked without interference at the root fillet. The practice of using a ring gage minor diameter slightly above the part's minor diameter, with chamfering or rounding the edge will not give a true check since these are difficult operations to perform accurately. The major TIF corresponds to the external spline major diameter minus two chamfer heights. For purposes of manufacturing clearance, the ring major diameter should be made about 0.020 larger.

In the broach and plug gage chart (Fig. 3), it can be seen that both broach and plug will have the same TIF diameter. However, since the plug will not have any major diameter radii or chamfers, the major TIF is also its major diameter. The plug and broach could both have the same minor TIF and minor diameters, however, the plug minor diameter should be 0.010 to 0.020 smaller for clearance. This will take care of the slight radii left by the grinding wheel due to corner wear.

Another use of the charts is to determine the location of the contact, using a given roll diameter. Multiply the D. P. by the roll diameter and find the intersection with the number of teeth on the graph. The relative position of the contact point to the various diameters is seen at a glance. For example, a 0.3125 diameter measuring roll is used to measure a standard external spline having 20 teeth and 8/16 D. P. To find the location at which it contacts, multiply the D. P. by the roll diameter: 8 x .3125, or 2.50. On chart "B" at the intersect of 20 teeth and 2.50, it shows that the roll contacts slightly below the major TIF diameter. Any roll much larger than 0.3125 will not contact on the involute profile.

Internal Spline

The major TIF diameter on the internal spline chart (Fig. 4) is taken from the standard spline table, while the minor TIF diameter is obtained by adding twice the standard minor diameter chamfer height to the minor diameter. It will be noted that the minor diameter value for internal splines is very nearly the same as the minor TIF diameter for external splines. Thus, an overlap of involute

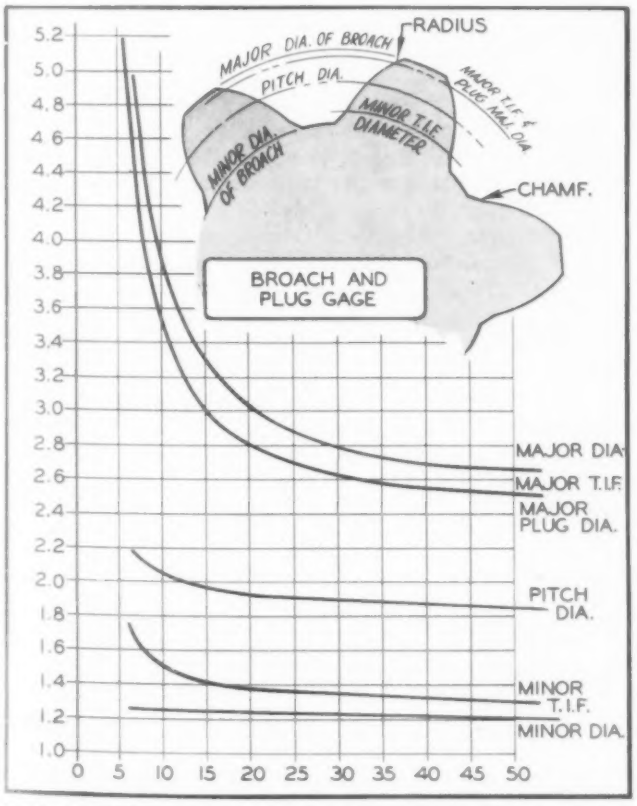


Fig. 3. In this diagram of broach and plug gage, both broach and plug have the same TIF diameter. The major TIF diameter is also the major diameter for the plug, since it does not have any major diameter radii or chamfers.

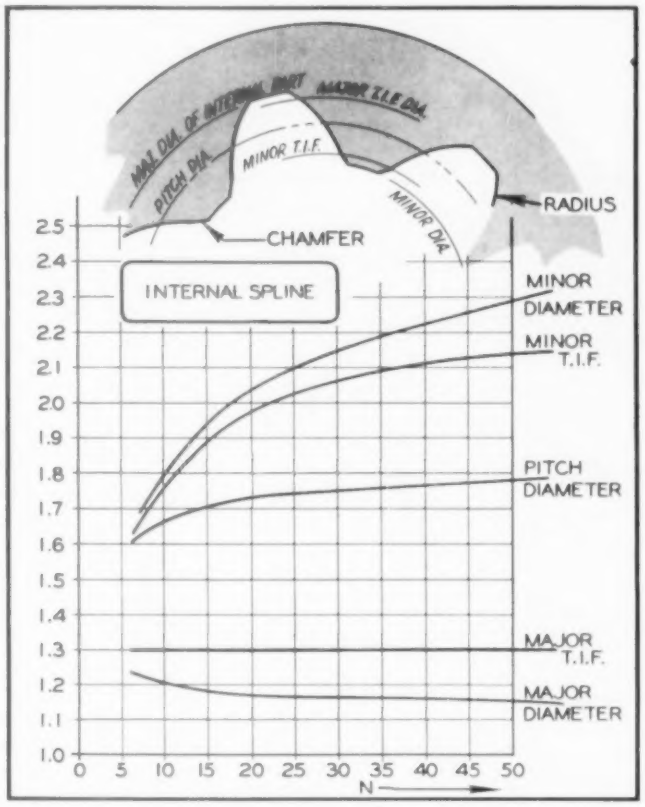


Fig. 4. The minor diameter value for internal splines as shown above is nearly the same as the minor TIF diameter for external splines.

General Equation for Determining Roll Diameter to Contact at a Given Dia. "D_i"
(On any Non-Helical Gear or Spline)

EXTERNAL

$$\frac{D_b}{D_i} = \text{COS } \phi_1 \text{ ; TAN } \phi_1 + \sigma_b = \phi_2 \text{ Radians}$$

D_b [TAN ϕ_2 – TAN ϕ_1] = Roll dia. contacting at D_i externally.

$$\sigma_b = \frac{\pi}{N} - \frac{t}{D} - \theta_M$$

—EXAMPLE—

Given:

13 tooth, $\frac{10}{20}$ D.P., 30-degree spline

$D = 1.300$
$D_c = 1.383$
$D_b = 1.1258$
$t = .1571$

Interpolation is not required for selection of roll unless special roll is to be made.

CHAM. HT. = .010 at major dia.

Required: Largest roll dia. that will contact on involute profile.

$$D_i = 1.383 - 2(.010) = \underline{1.363}$$

$$\sigma_b = \frac{\pi}{13} - \frac{.1571}{1.300} - .0538 = \underline{.0671}$$

$$\text{COS } \phi_1 = \frac{1.1258}{1.363} = .8260 \text{ ; } \phi_1 = 34.31°$$

TAN $\phi_1 = \underline{.6824}$

$\phi_2 = .6824 + .0671 = \underline{.7495}$ *Radians*

1.1258 [.7495 – .6824] = $\underline{\underline{.279}}$ Roll diameter

INTERNAL

$$\frac{D_b}{D_i} = \text{COS } \phi_1 \text{ ; TAN } \phi_1 - T_b = \phi_2 \text{ Radians}$$

D_b [TAN ϕ_2 – TAN ϕ_1] = Roll dia. contacting at D_i internally.

$$T_b = \frac{\pi}{N} - \sigma_b \text{ or } \frac{t_s}{D} + \theta_M$$

—EXAMPLE—

Given: 13 tooth, $\frac{10}{20}$ D.P., 30-deg. internal spline

$D = 1.300$
$D_R = 1.221$ $D_b = 1.1258$
$t_s = .1571$
Chamfer ht. = .012

Required: Largest roll dia. that will contact internally on involute profile

$$D_i = 1.221 + 2[.012] = \underline{1.245}$$

$$T_b = \frac{.1571}{1.300} + .0538 = \underline{.1746}$$

$$\text{COS } \phi_1 = \frac{1.1258}{1.245} = \underline{.9043}$$

$\phi_1 = 25.28°$; TAN $\phi_1 = \underline{.4723}$
$\phi_2 = .4723 - .1746 = \underline{.1654}$ Radians
TAN $\phi_2 = .3069$

1.1258 [.4723 – .3069] = $\underline{\underline{.186}}$ Roll dia.

Contacting internally at 1.245 diameter select nearest roll available.

NOTE—"*Involutometry and Trigonemetry*" by Vogel is recommended since all trigonometric functions radians, and involute functions are on one double page. This makes the calculations very rapid.

profile is provided in the standard design.

As an example, a standard internal involute spline which has 13 teeth and 10/20 diametral pitch requires three sets of measuring rolls to check the tooth space at several points along the profile. Fig. 5 shows the contact position of measuring rolls on an involute profile.

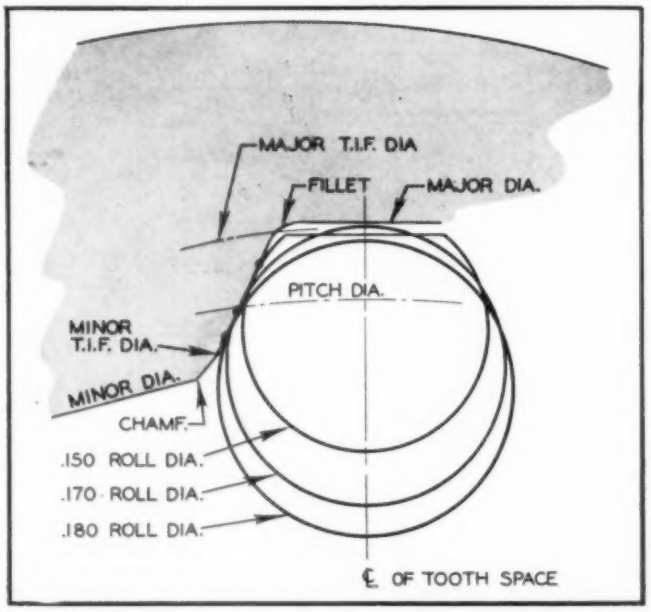


Fig. 5. The contact positions for various measuring rolls on the involute profile are shown here.

Entering the chart (Fig. 4) at N = 13, a line is selected about halfway between the pitch diameter curve and the major TIF diameter curve. This line leads to 1.50, which is the roll diameter to use for a 1 D. P. spline.

For a roll to contact at the pitch diameter, the internal line is 1.70. Then, 1.70 divided by 10 is 0.170 roll diameter.

Near the minor TIF diameter, the 1.80 line is selected which yields a 0.180 roll diameter. The three roll diameters are 0.150; 0.170; and 0.180. The nearest available sizes may be used but caution is required. For instance, if the 0.180 roll is rounded off or raised up to 0.1875 diameter, the contact will be outside the true profile limit as shown by the minor TIF curve. This is also shown by the calculated example. Having selected the measuring roll, involumetry is used to obtain dimensions between the rolls.

Nomenclature

D. P.—Diametral pitch
T_b —Base-tooth semi-angle
$_b$ —Base-space semi-angle
t —Circular tooth width
t_s —Circular space width
D —Pitch diameter
D_b —Base diameter
O_m —Main pressure angle
O_m —Involute of main pressure angle
Major TIF—Junction of involute with fillet or chamfer near major diameter
Minor TIF—Junction of involute with fillet or chamfer near minor diameter

By **Thomas A. Dickinson**

Machining Metallized Surfaces

Metal-sprayed parts may be machined like ordinary castings

SPRAYED ALLOYS GENERALLY have a rather rough appearance and cannot be applied with great dimensional accuracy. If adequate precautions are observed, these materials can be machine finished much like ordinary iron castings.

Assuming that an alloy has been sprayed so that it will have the most desirable physical properties (in terms of density, tensile strength, hardness, adhesion, cohesion, etc.) the machinist's most important consideration is the thickness of the sprayed alloy layers. Generally speaking, machining should not be attempted when the thickness of a layer is less than 0.010 in.

If the layer is more than 0.010 in. in thickness, the feasibility of machine work depends on the required depths of various cuts; and, in any event, the machinist must bear in mind the fact that comparatively light feeds are essential—since sprayed alloys never are as solid or dense as other forms of the same metals.

Tool bits with three side rake angles (12 to 15 deg, 8 to 12 deg, and 0 to 5 deg) are usually desirable, regardless of whether the surface is internal, external or flat. Such bits may be utilized in a standard tool holder, which should have a 15 deg rake.

Recommended feeds, speeds and bits for specific types of sprayed alloy materials are given in Table I.

TABLE I—RECOMMENDED CUTTING SPEEDS, FEEDS AND TOOLS FOR MACHINING SPRAYED ALLOYS

Sprayed Alloys	Tool Rake (Deg)	Surface Speed (Ft per Min)	Inches Feed (per Rev)
Aluminum	12-15	125-200	.003-.005
Babbitt	12-15	150-250	.005-.008
Yellow brass	8-12	100-125	.003-.005
Commercial bronze	12-15	100-125	.003-.005
Phos. bronze	0-5	100-125	.003-.005
Tobin bronze	0-5	100-125	.003-.005
Tufton bronze	0-5	100-125	.003-.005
Copper	12-15	100-125	.003-.005
Lead	12-15	150-250	.005-.012
Monel	12-15	100-125	.003-.005
Nickel	12-15	100-125	.003-.005
Swedes iron	12-15	50-100	.003-.005
10-carbon steel	12-15	75-100	.003-.005
25-carbon steel	8-12	50-100	.003-.005
40-carbon steel	8-12	50-100	.003-.005
80-carbon steel	Must be ground		
120-carbon steel	Must be ground		
18-8 stainless	12-15	100-125	.003-.005
Hi-chrome steel	Must be ground		
Tufton steel	Must be ground		
Tin	12-15	150-225	.006-.008
Zinc	12-15	150-225	.006-.008

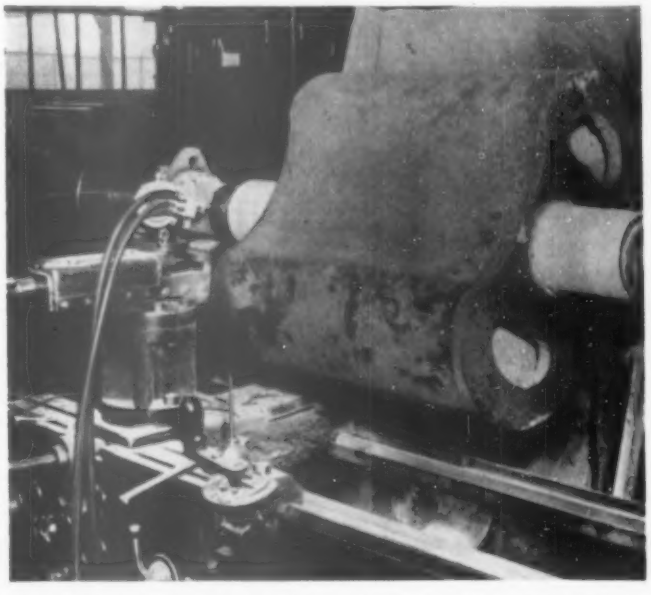
A 50-50 mixture of kerosene and cylinder oil can generally be used to improve the machining qualities of commercial bronze, yellow brass, aluminum, copper, iron and steel alloys. It should be applied with a brush and allowed to stand for about 30 min. before machining.

Roughing in work should usually be done to about 0.010 to 0.015 in. over the specified finish dimension, and in most cases it is advisable for inexperienced machinists to experiment with several different tool settings in order to determine how the most desirable finish can be obtained.

Internal surfaces can be rough and finish bored in a conventional manner with the previously-described bits, providing the boring bar is heavy and well-supported for light feed and cuts. However, internal grinding equipment is often preferable in this type of work.

Flat surfaces with sprayed-alloy coatings are not usually milled, because the cutters of milling machines have a natural tendency to chip porous materials. However, such surfaces can be satisfactorily machined with shapers and planers after all high spots and flash have been removed by filing or grinding so that there will be no danger of gouging.

When the principal purpose of finishing operations is to improve the appearance of a sprayed alloy, Metallizing Company of Los Angeles engineers claim best results can be most rapidly achieved by grinding, buffing and wire brushing, the extent of the work depending upon the luster required in the final finish.



Repair of this casting by metal spraying provides an economical method of salvage; subsequent machining will assure its dimensional accuracy.

A 3500-rpm portable grinder with a ½ hp motor has been extensively used in grinding and wire brushing a variety of nonmechanical surfaces. Its attachments include a 6-ft flexible shaft with a ball-bearing handpiece, a 3x3 in. sanding drum, a sanding disc holder for 3 to 4 in. diameter sanding discs, and fittings for mounting wire brushes or buffing wheels. The sanding drums are rubber mandrels on which abrasive sleeves are mounted as follows:

(a) 60-grit for roughing
(b) 80-grit for general-purpose work
(c) 100 to 120-grit for final finishing

If the alloy layer is not exceptionally rough, and if the brightest-possible finish is not requisite, the most rapid and economical form of finishing is wire brushing. This work has been satisfactorily accomplished with 4 to 6 in. diameter brushes made from 24 to 36 gauge wire (which should match the color of each surface that is to be finished).

by A. E. Rylander

34-19400

Automatic Finishing Cuts Cost

AUTOMATIC AND semi-automatic polishing and buffing of metal and non-metallic parts effects marked economies, not only in remarkably reduced manufacturing and materials handling costs, but in conservation of valuable floor space. There is the further advantage of reduced operator effort with commensurate increase in safety. In some installations, the operator need only to fill magazines or hoppers, while abrasive dust is removed by fan suction. Thus, there is the further advantage of clean, healthy working conditions in the finishing department.

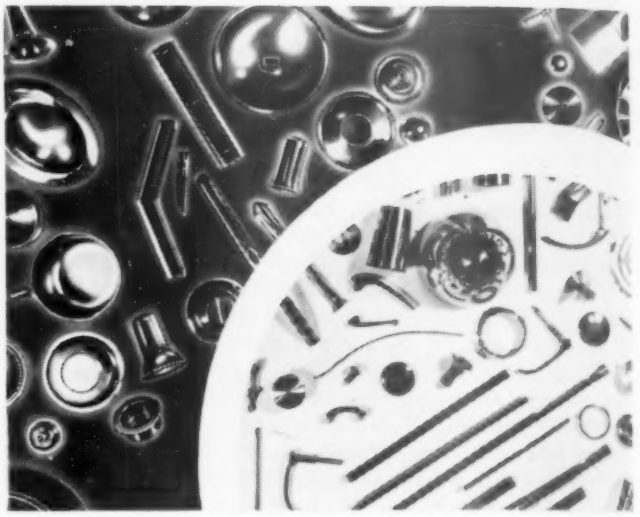
Typical of modern finishing equipment are the three basic standard machine types—rotary automatic; straight-line automatic; and semi-automatic—manufactured by the Acme Manufacturing Company, Detroit. With occasional "specials", these machines permit automatic finishing of parts from the size of collar buttons and small instrument screws to such items as refrigerator door panels and large automotive bumpers. There is practically no limit to shapes that can be finished, and length is limited only by the length of a conveyor and the building which houses it.

In view of the wide diversity of parts suited to automatic finishing—jewelry, hardware, automotive accessories and trim, stove parts, molding, to mention but a few—the term "standard" is here used advisedly. For while the basic machines are standardized, each installation is likely to be more or less a "custom job" engineered for a specific part or combination of parts.

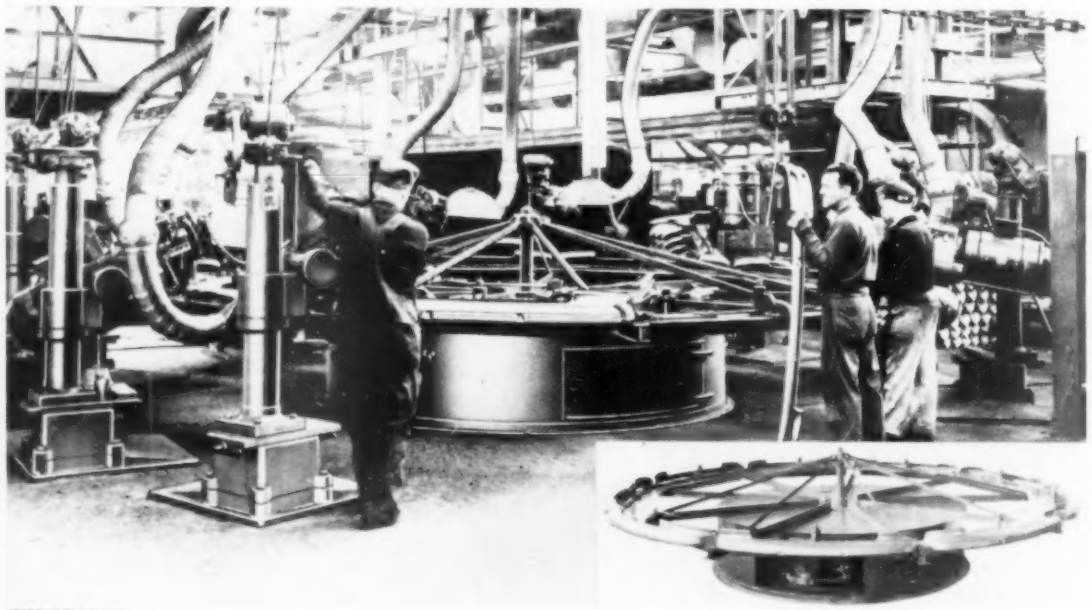
An installation would depend on the nature of the work to be finished, the type of finish required, and the production volume desired. Also, while a given job might be handled on any one of the basic types, the requirements may make any one or a combination of types the most efficient for the purpose.

The machines alone are not enough. In common with machine tools—and metal finishing is a cutting operation on a fine scale—the machines used for finishing require fixtures to hold the work. And, depending on the job, these range from simple push-on or throw-in devices to fully automatic pneumatic and mechanically operated loading, clamping and unloading devices. In some cases, parts are hopper or magazine fed, the operator being required only to keep the magazines supplied with an accumulation of parts.

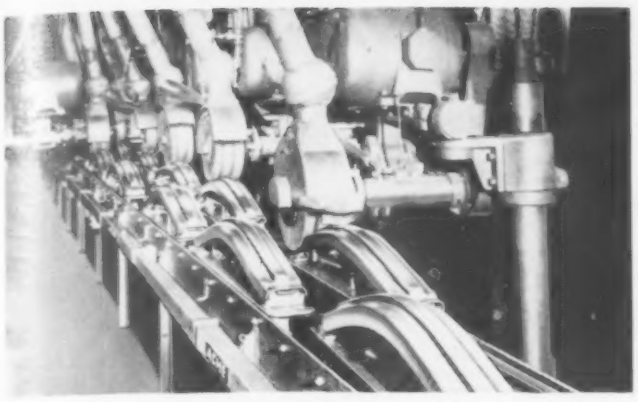
Considering the variety of parts, therefore, the basic equipment is subject to almost endless adaptions, not only

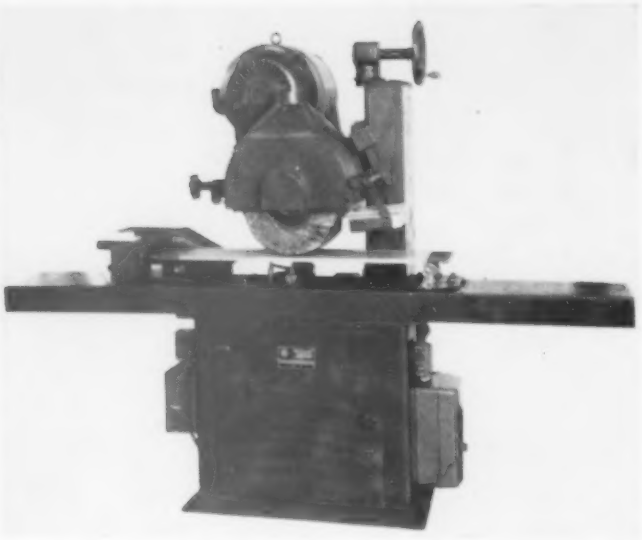


A few of the limitless list of parts—automotive, builders, marine and range hardware, grilles, bathroom and electrical fixtures, household appliances, cooking utensils, gears and so on—that may be buffed and polished on the finishing equipment described on these pages.



An 18 ft. continuous rotary automatic polishing and buffing machine set up to finish automobile bumpers. This installation is made up of standard units—as, for example, ten adjustable floating head lathes shown around the installation, and the 18 ft. rotary conveyor shown in the insert, lower right. The latter unit, which has a standard 10 ft. base, has variable speed control and is equipped with quick-acting toggle clamping fixtures. Note the suction lines in the installation, for removing abrasive dust from the working area. The machine takes up comparatively little space, yet is tantamount to a straight line installation almost 75 ft. long, counting loading and unloading stations.



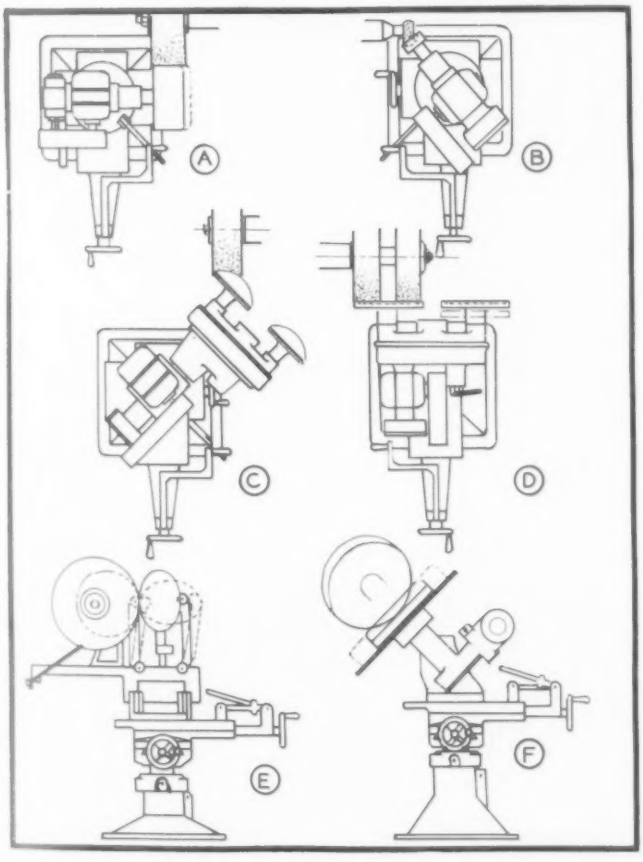


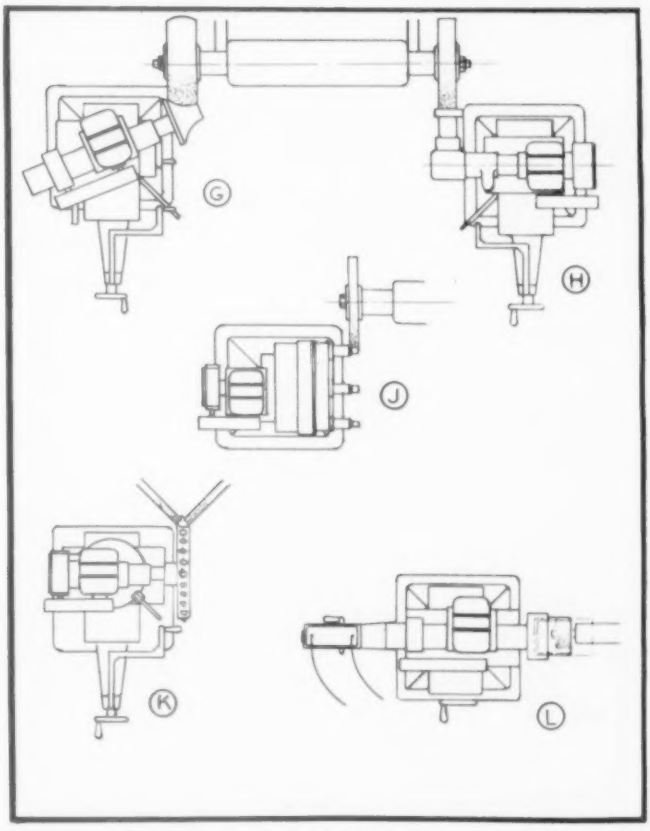
Above, a straight-line automatic polishing and buffing machine used for finishing long straight parts or long parts wth slight curvatures that cannot be readily handled on the rotary. At right, an automatic tube polishing machine designed for polishing and buffing round, square or polygonal tubing. At the end of each stroke, the work is indexed to present a new surface to the wheels. Flat parts may also be polished, the machine operating after the manner of a surface grinder.

of the machines themselves, but of special fixtures and holding devices such as tailstocks, chucks, odd-contour work holders, camming arrangements for out-of-round parts and ball bearing retainers. Conveyors, too, may be part of the equipment, and these may also be fitted with loading, holding and unloading devices. In other words, the major economy is to be achieved by a coordination of machines and fixtures specifically engineered for a specific job.

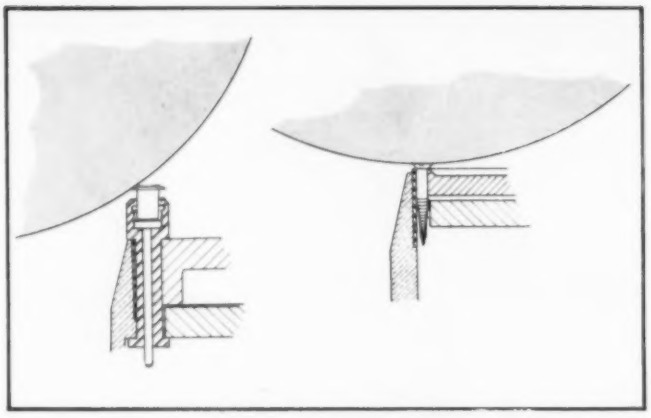
Of the three basic machines produced by the Acme Company, the rotary automatics are suited to work which is either short enough, or has enough curvature, to be handled by a rotary-type conveyor or base, the work being loaded at one station. Then, after passing over or under the required number of polishing heads for the finishing, it is discharged at a station adjacent to loading or, preferably, at the same station. The machine may be continuously rotating or indexing, depending on the nature of the work.

Where work is too long for a rotary—as, for instance, long moldings—then the straight-line automatic is used. This machine is similar in principle to the rotary except that flow is in a straight line. As many polishing heads as may be required are placed adjacent to the conveyor which, like the rotary, is equipped with suitable work-holding fixtures. As a rule, these work automatically. Here, of course, the work is loaded at the head of the conveyor and discharged at the





Shown here are typical setups for various applications. At A, a setup for finishing outside on large cylindrical parts; at B, buffing reflectors, and at C, an index head arranged to buff hub caps. Incidentally, these parts may be vacuum held, as previously suggested. D is also an index head installations, for buffing automotive horn rings. At E, a setup for finishing oval toaster bodies, and at F, an installation with geared chuck for finishing a roaster cover. G shows a setup with a formed polishing wheel for finishing outside diameter of a stool base, and at H, the same head set up with a right-angle attachment for "face" finishing. J shows a conventional setup for finishing small work on outside diameter, and K, a ferris wheel type fixture used with two special offset buffing lathes for continuous rotary finishing of small parts. At L, a setup for finishing the inside diameter of cylindrical parts. This installation includes an air-cylinder pullback and timer control arrangement. The installations shown are but a few of an endless variety.



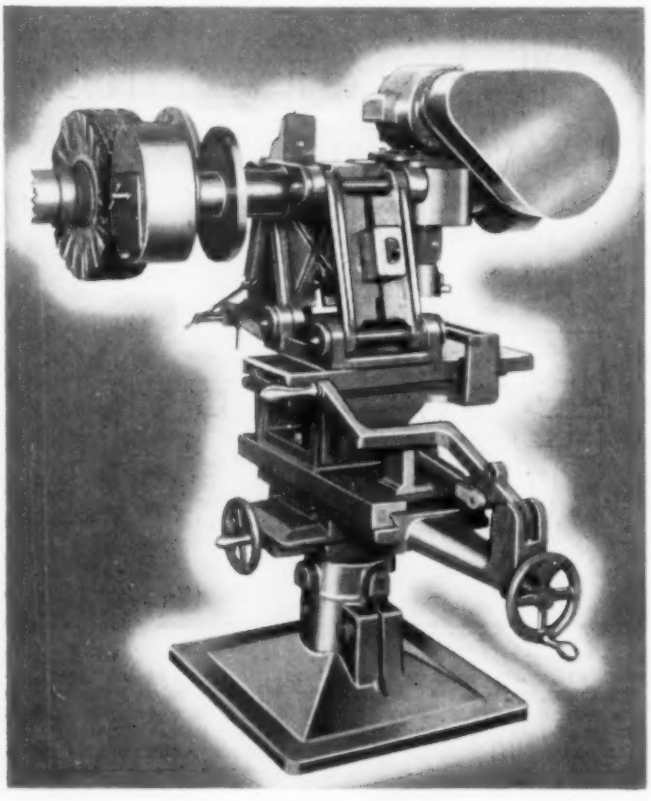
Schematic diagrams showing how small parts are automatically polished and buffed. A spring clip holds the stud, which is pushed out by the ejector riding up on a cam at the end of the polishing cycle. The screw is merely dropped into the circular slot and falls out through an opening. In both installations, the workpiece is rotated between a revolving disc and a hard-faced ring, with drive by friction between the disc and ring. Parts of the type shown may be hopper fed if so desired.

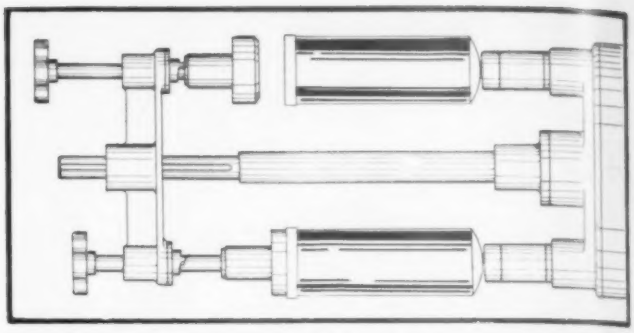
tail end, the fixtures returning to the loading station after the manner of a conventional belt or chain conveyor. Long tubes may be finished on centerless-type installations.

The semi-automatics are hand or automatic indexing as a rule, and may be equipped with one or several work-holding fixtures. The operator loads one fixture, indexes to the polishing head, or past several heads if multiples are required. With some installations, the workpiece is loaded on a rotary table—as, for example, when dished or flat circular parts are to be polished all around either inside or outside, or both.

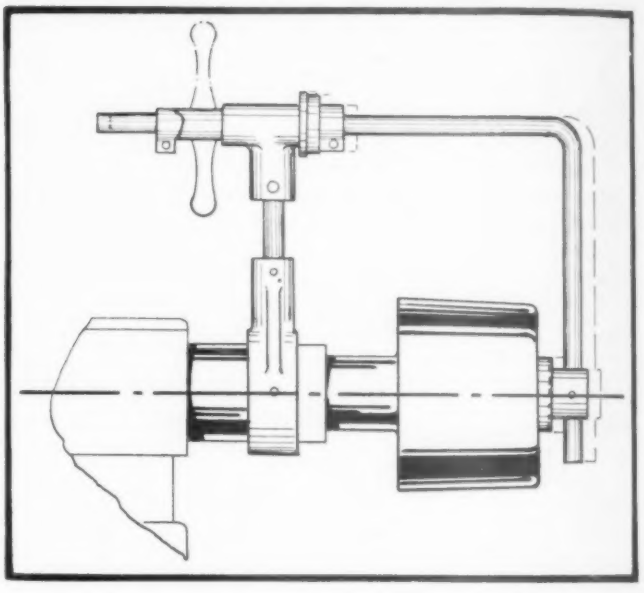
In view of the wide diversity of polishing operations and installations, it would be futile and entirely beside the point to stress any one particular installation. What would be suited for one application would probably be inadequate for another—although, as far as that goes, the equipment is so flexible that remounting or reworking is readily done to suit nominal seasonal changes.

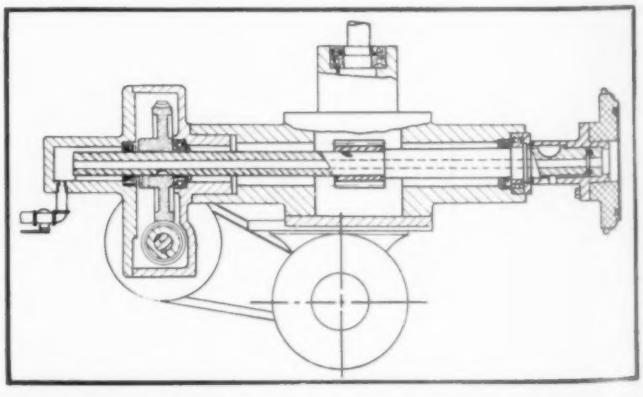
Rather, we will illustrate typical polishing jobs and the setups required, with description of the job in the accompanying captions. As a concluding note to the text, however, it may be worthwhile to say that where quantity of product and production output warrant there is practically no shape or length that cannot be finished with automatic or semi-automatic polishing and buffing machines. The method is efficient, safe and economical, with the savings in reduced finishing costs so marked that even the most highly specialized installation should be amortized in a comparatively short time.





Shown, above and below, are two types of ball bearing tailstock work holders. The single holder is used on the single-spindle machine. The tailstock pad swivels clear for loading and unloading, the arrangement permitting use of plain type chucks or work holders. The 2-spindle arrangement is used with an index head and is here shown arranged to buff long diametrical parts. However, longer parts are preferably finished on the straight-line or a tube polishing machine, the latter a centerless on some installations.





At right, an Acme Type D-10, with stroke. This oscillating machine is used with a conventional polishing lathe for polishing and buffing out-of-round work such as oval or rectangular roasting pans, square waffle gases, and similar odd-contour parts. The chuck shown just ahead of the cam and in front of the wheel is designed to hold a toaster body. The illustration above shows a cross-section of a spindle housing with a typical vacuum chucking arrangement. The part is merely slipped onto an adapter or holder and is then held by vacuum during the polishing operation.

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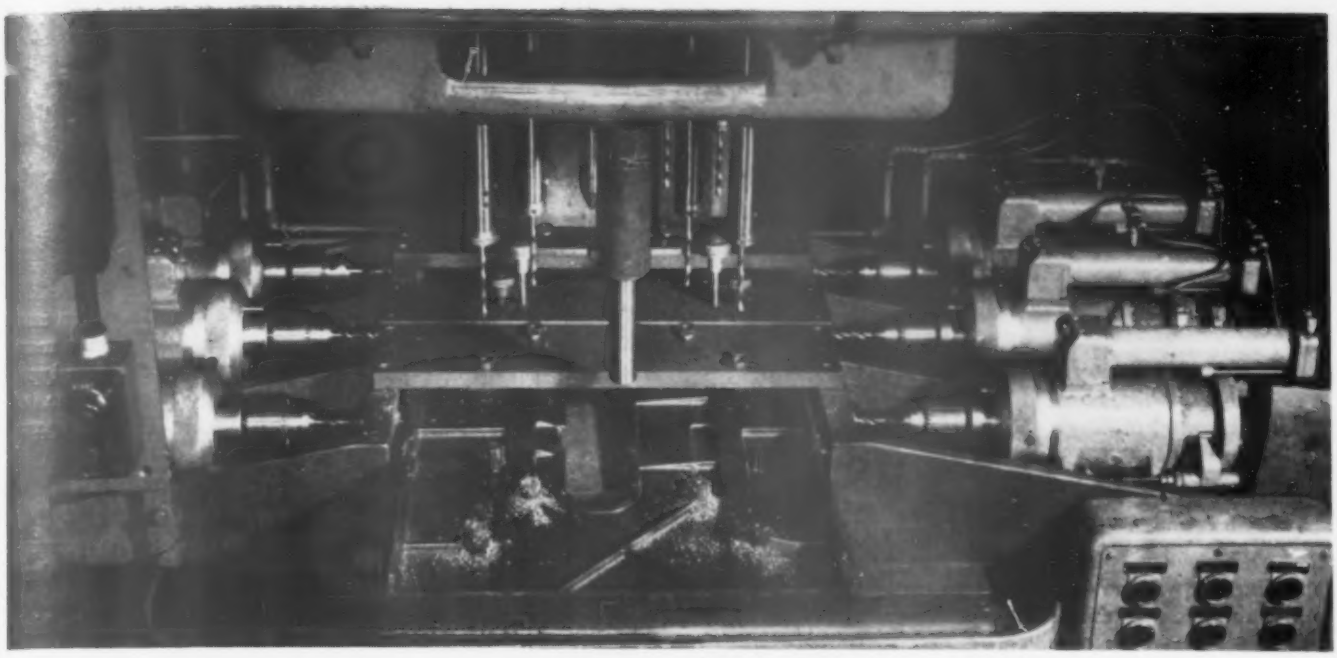


High Production with Standard Equipment

By Lloyd L. Lee

BY COMBINING STANDARD machine tools with standard auxiliary drilling units, plus clever tool engineering, the Central Specialties Division of the King Seeley Corporation, Ypsilanti, Michigan, is able to achieve production output that, in many instances, equals that usually obtained from special purpose equipment.

One such case is the drilling of eight holes for 5/16-18 tap, in the bottom of a saw table, and three ⅜ in. holes in each of the two sides, as indicated in the part drawing, Fig. 1. The milling has been previously done on a standard machine with no unusual methods employed; however, the six bottom holes and the six side holes are all drilled in the one handling.

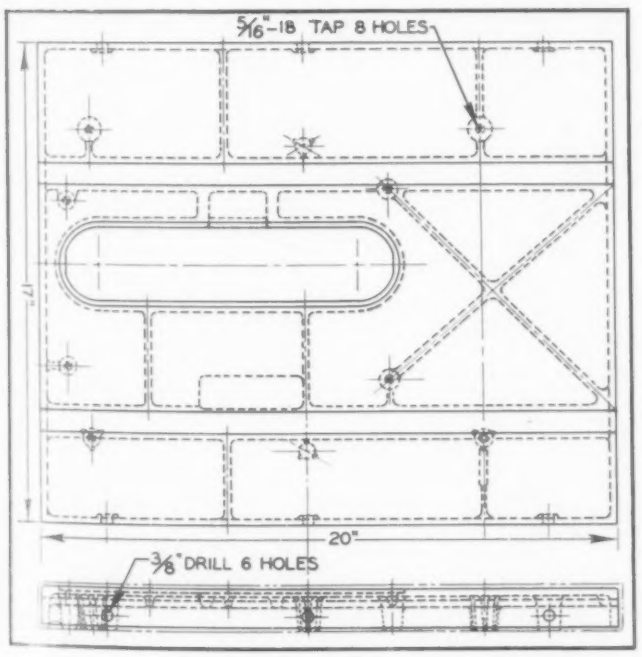


Fig. 1. A saw table, in which it is required to drill eight holes in the bottom as indicated, and also three holes in each of the opposing sides. All of these holes are drilled in one handling using standard drill units and a standard machine.

The tool setup consists of a standard Natco B-2 Vertical 10-spindle drilling machine provided with a cluster box for eight spindles. On the fixture, which incorporates spring-loaded hold-downs for clamping the part, are six Cleveland Republic Model 250 belt-drive drill units, mounted three per side. Because the side holes are too closely centered to permit mounting the motors directly on the heads, a 1 HP motor is used to drive the two end units, and ½ HP motor for each of the remaining units, with drive through V-belt.

The Natco machine has hydraulic feed and the units have air-draulic control. Air pressure is supplied by the shop compressed air system. Feed is controlled by metering oil from the forward side of the piston, the latter virtually a hydraulic check. A limit switch, mounted on the machine column and operated by movement of the vertical head, operates a relay to close the circuit in each of the drill units, which are wired in series.

The side units rapid traverse to the work, feed and return automatically. Nominally, these units are designed to return to starting position; individually, as soon as they have completed their drilling cycle, but by wiring them in series they cannot return until all have completed the cycle—that is, all of the units now work in unison. As a consequence, the setup provides a 3-way machine to all practical purposes, with the following advantage:

A change in part design, or obsolescence of the part, means only that a standard 10-spindle drilling machine, and the six auxiliary units, can be modified to suit the change or placed on the available list. Even the fixture may be reworked to suit a change in model. The drill units may be further altered to suit different feeds, speeds and length of stroke.

Fig. 2. Top of page. The tool setup. A Natco B-2 Vertical 2-spindle drilling machine with a cluster box for eight drills. The side units are CRT Drill Units, built by the Cleveland Republic Tool Corporation. The vertical machine drills the eight holes indicated on the plan vies, and the side units drill the three ⅜ in. holes in the two sides. Machine and side units are synchronized, and all holes are drilled in the one handling.

By J. W. Lengbridge

General Notes on Aluminum Presswork

Installment No. 10 of a Series on the Theory and Practice of Pressing Aluminum

As per concluding note in the preceding issue, we will briefly discuss die cushions before entering into the general theme of this installment. As one of the features of double-action presses, these mechanisms provide means for controlling flow of metal in drawing operations, with pressure fairly constant throughout the stroke.

Single-action presses lack this feature, and therefore require supplementary blank-holding equipment, such as die cushions, to provide the pressure necessary to control metal flow. The pressure applied may or may not be constant, depending on the type of die cushions used—that is, whether spring, rubber, mechanical or hydro-pneumatic type.

Rubber and spring cushions, of which typical examples are shown in Figs. 83 and 84, are by far the most common. They are simple and economical and, for the majority of jobs, quite satisfactory. However, the disadvantage of this type is that pressure increases as the draw proceeds and, as they stiffen, there may be exerted sufficient pressure toward the end of a deep draw to retard movement of the metal by holding it too tightly. Also, because the metal is being drawn through the die, the flange size decreases as pressure increases; therefore, pressure per square inch may exceed the strength of the metal, resulting in fracture.

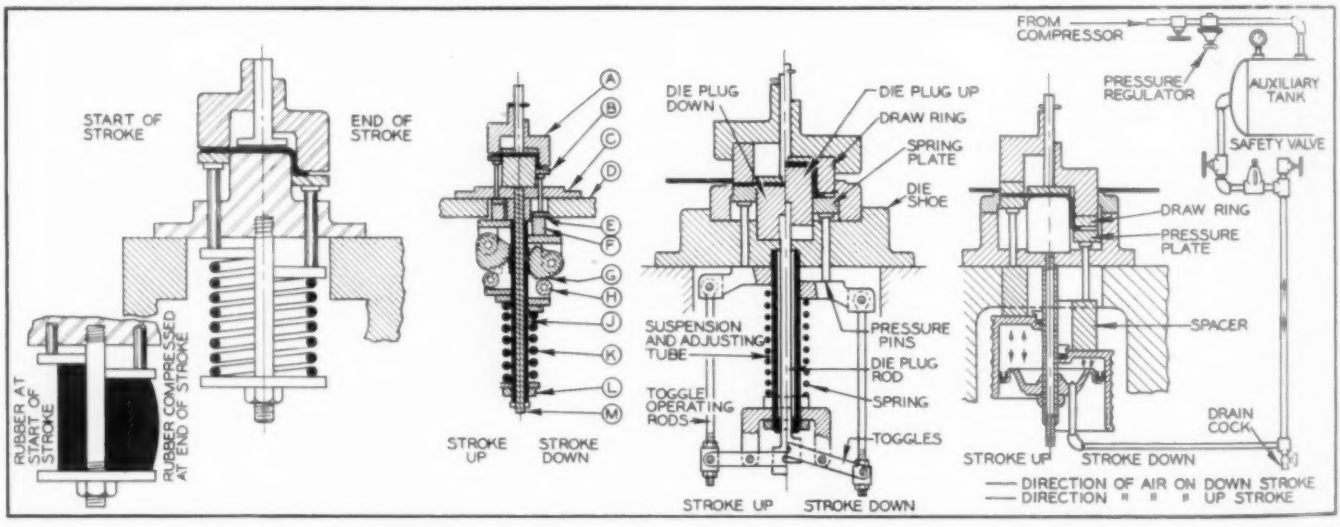
Mechanical types, such as the Marquette and Rhodes spring cushions shown in Figs. 85 and 86, are designed to overcome these faults. The latter is an English design and, like the Marquette, is an attempt to improve on the more common rubber or spring cushions. However, the best types of cushions are the pneumatic and hydro-pneumatic, of which a typical installation is shown in Fig. 87. The operation of these cushions is explained in the captions.

Drawing Speeds

The speed at which metal can be worked, in pressing operations, depends on the type of cold work being done and the kind of metal used. While cutting, and small shallow drawing operations, can usually be performed at quite high speeds, deep draws on large shells demand much slower speeds than cutting operations, and operations involving severe wall reduction are more successfully performed at comparatively slow speeds.

Metals which work-harden rapidly should be drawn at slower speeds than those which work-harden slowly, in order to permit flow to take place, and the diameter reductions per operation should also be less. With metals which are difficult to draw, experience indicates that the slower the

These articles are in collaboration between the author, Mr. Lengbridge, and the Aluminum Laboratories of Kingston, Ontario.



Typical examples of rubber, spring and pneumatic die cushions are shown in Figs. 83 to 87, left to right in that order. Fig. 83 shows a rubber cushion, and Fig. 84 a spring cushion. One of the disadvantages of these types of cushion is that pressure increases as the draw proceeds. This increasing pressure, on a decreasing flange as the draw proceeds, may exceed the strength of the metal and cause fracture. To minimize this fault, the cushions or springs should be long enough to allow for considerable compression before becoming too solid.

Fig. 85 shows the Marquette spring cushion, designed to overcome the faults of the cushions previously described. This cushion consists of two cam gears operating on a center rack. The lower edge of the cams work on rollers attached to a spring plate. As the draw proceeds, the compensating cams roll on the rack and allow the spring plate to move up, thus maintaining more or less constant compressed distance between the upper and lower spring plates. This results in a somewhat close approach to uniform pressure throughout the drawing cycle. The letters, A through M, designate the punch, pressure plate, die shoe, press bolster, pin plate, spacer, compensating cams, rolls, compensating rack, spring, pressure adjusting nut, and suspension bolt.

Fig. 86 shows the Rhodes spring cushion, which is based on a slightly different principle. A toggle block is suspended on a pipe, which is attached to the die shoe. A rod, running through this pipe, is connected to one end of the lower toggle at the bottom, and to the die plug at the top. The pressure block is connected through rods to the outer end of the toggle. As the draw proceeds, the pressure block is pushed down. This movement through the toggles pushes the drawing block up into the draw ring. In other words, a downward movement of 1 inch on the punch will bring the drawing block up 1 inch, thus drawing the shell a total of 2 inches. The spring is only compressed half the amount required for a spring or rubber type cushion.

The best types of pressure control media for single-action press drawing operations are the air and hydro-pneumatic cushions, of which a typical example is shown, installed, in Fig. 87. The piston rod is attached to the underside of the die or press bed, whichever is most convenient, and the cylinder is made to contact the pressure pins located under the pressure ring. The downward movement of the latter pushes the cylinder down against the cushion of air in the cylinder, and moves the air back into the supply tank. On the up-stroke, the same air pushes the cylinder back to the starting point—that is, the air is not consumed except to replace losses that may occur as a result of leakage. Hydro-pneumatic and hydraulic cushions operate on practically the same principle.

speed the greater the uniformity with which the deformation will spread over a large area.

Pressing operations involving severe wall-thickness reduction should be done at slower speeds than drawing operations, particularly if done on mechanical presses. This is because of the effect, on the flow, of the sudden impact of the punch on the metal. Hydraulic presses are better for this type of operation because of a better control of drawing speed. In this connection, wire drawing is quite similar in principle to press ironing, and tube drawing is similar to redrawing; however, the high speeds of wire and tube drawing cannot be used in press operations.

Lubrication An Important Factor

Drawing poorly lubricated metal into metal dies at excessive speeds is comparable to running a steel shaft at high speed in a poorly lubricated bearing.* In both cases the undue friction will cause scoring. A scored die will leave a scratch on each shell drawn into it, particularly if the metal being drawn is soft. When drawing steel blanks into steel dies under such conditions, the friction will cause small particles of metal to be picked up from the blank and more or less welded into the die surface, even when hardened dies are used. These "pick-up" particles are difficult to remove, will not slide off when the next shell is drawn, and cause deep scores or scratches on the shell wall.

Troubles from this source are quite common when drawing steel, and can usually be eliminated as follows: (1) By slower drawing speeds; (2) by the use of "pick-up" resisting tool surfaces, such as nitrided dies, cemented carbide, chrome plated or hard bronze dies; and (3) by the use of a lubricant—such as a water-soluble type—which will absorb some of the heat of the operation and yet not break down under surface pressures. Fortunately, "pick-up" is not usually a problem in drawing aluminum, yet, one or all of these aids may be necessary when drawing some of the aluminum alloys.

Speed Not Constant

The drawing speed of a mechanical press is not constant throughout the stroke, due to the slide being operated from a crank mechanism. The diagram in Fig. 88 illustrates this change in speed, which varies from a low at the start of the stroke to a high as it approaches mid-stroke, then slows progressively to the bottom of the stroke. The working stroke is usually the lower half of the punch travel, and the highest speed is at this part of the slide movement.

In the diagram shown, the working speed would be slightly less than 24 ft. per minute. The change in speed as the slide comes down is not a serious disadvantage, but it is nevertheless a factor to be considered. In hydraulic presses, the ram effects contact with the metal without the sudden impact that is typical of a mechanical press, and then goes through the working stroke at constant speed. This is an advantage and results in a more uniform flow.

The following formula may be used for finding the press slide velocity in the drawing zone or working part of the stroke:

$$V = SPM \times C \times dY = Y^2$$

In which V = press slide velocity in ft. per minute; SPM = strokes per minute; C = constant 0.5233; d = stroke in inches; and Y = distance from bottom stroke to point of contact in inches—usually about ½ d on double-action draw presses.

As calculated by this formula, the velocity indicated in Fig. 88, is 23.5 fpm, which checks closely with the speed shown in the diagram. However, the drawing speeds indicated in Table 7 are approximately correct for the metals shown, and may be taken as a guide. Data further shown in Table 8 is taken from the results of a battery of mechanical double and single-action presses operating mainly on aluminum. Most of the press equipment listed in Table 8 was used during the war for brass, deep drawing steel, stainless steel and copper, and produced good work at the drawing speeds stated. However, die wear and "pick-up" troubles, which occurred, might have been less with some adjustment of the drawing speeds.

* Recommendations for lubrication will be made in a later installment.

TABLE 7. OPEN DRAWING SPEEDS FOR DIFFERENT METALS

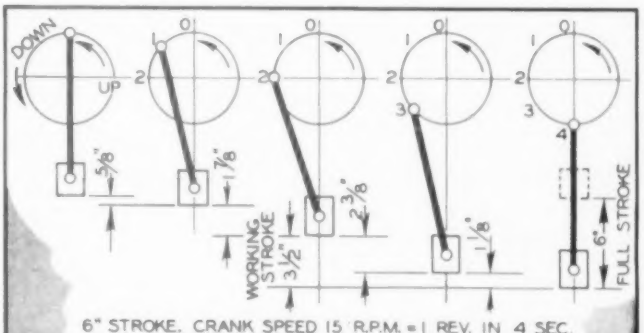
MATERIAL	SINGLE-ACTION PRESSES	DOUBLE-ACTION PRESSES	IRONING
Stainless steels	40	30	20
Low carbon steels	50	40 - 50	25
Zinc	150	40 - 50	..
Aluminum	160	50 - 80	60
Copper	150	60 - 85	50
Brass	200	80 - 100	70

TABLE 8. PRESS RAM VELOCITY

SIZE OF PRESS	TYPE OF WORK	RAM VELOCITY, F.P.M.
100 to 150 ton, single crank, double action	Light draws	60 to 80
160 to 250 ton, single crank, double-action	Medium and Heavy draws	50 to 65
125 ton Double crank, Double-action	Large shallow draws	25 to 40
60 ton Single-action	Blanking	150 to 160
35 to 50 ton, Single-action	Forming	115 to 125
5 to 20 ton, Single-action	light cutting and shallow blank and draw work	160 to 190

Calculations For Blank Size

It has been previously stated, in this series, that in free drawing the area of the finished shell should be approximately the same as the blank from which it was drawn. This fact is the basis on which blank calculations for the type of drawn shells under discussion are made. Care in calculating or developing the blank size and shape is an important factor in most drawing operations. This holds particularly for deep



6" STROKE. CRANK SPEED 15 R.P.M. = 1 REV. IN 4 SEC.

MOVEMENT OF CRANK	SLIDE TRAVEL	TIME	SLIDE SPEED F.P.M.
FROM 0 to 1	5/8"	½ SEC	6
" 1 " 2	1 7/8"	"	19
" 2 " 3	2 3/8"	"	24
" 3 " 4	1 1/8"	"	
" 4 " 0 RETURN	6"	2	15

Fig. 88, showing variation in speed of crank operated presses. The downward stroke starts slowly at top dead center, accelerates toward the middle of the down-stroke, and decelerates in equal ratio toward bottom dead center.

draws for which the size must be correct, and in irregular shapes for which the contour of the blank must be correct. The effect of incorrect blank size and shape are briefly as follows:

1. Oversize blanks complicate the operation because unnecessary metal is under flow stress. High unit costs also result, because the surplus metal, purchased at full metal value, can be credited only at scrap value. Since the metal cost in most aluminum pressings is the major part of the finished cost, this point is important.

2. Undersize blanks will not make full depth shells unless stretched by blank-holder pressure, and this procedure results in thinning the metal at the corners and thereby lowering the quality of the product.

3. Incorrectly-shaped blanks. The flow occurring in rectangular and irregularly-shaped shells is unbalanced and may be quite severe at some points. If the blank is not correctly shaped, there may be too much metal at points where minimum flow resistance is desirable. If the blank is correctly shaped, there will be no unnecessary metal being made to flow at these points.

Methods Of Calculation

There are several methods as, for example, mean height; weight; trial; and the area method—which may be used to calculate the blanks for drawn shells. Of these, the area method is the most commonly used. Some blank sizes are developed by calculation, some graphically, and some by a combination of calculation and layout. The minor change in thickness, occurring in free-drawn shells, is usually ignored in these calculations because the trim allowance compensates for this change.

Blanks for shells in which the wall thickness is to be reduced substantially by ironing are best developed by trial. This method is also recommended for irregularly-shaped shells which cannot be divided into simple sections. When a press-

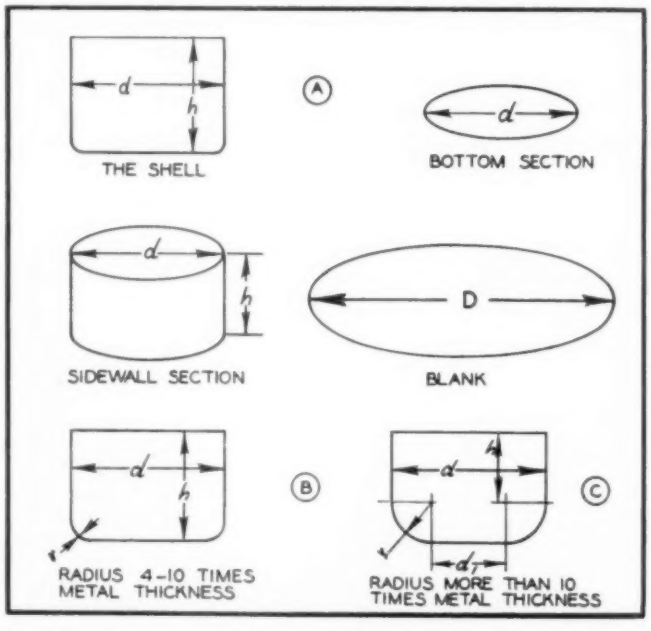


Fig. 89, showing area method for calculation of blanks. The simplest type of drawn shell is shown at A, upper left. The sidewall section of this shell, shown at lower left, is a straight bottomless cylinder having a diameter d and a height h. Area A of sidewall is arrived at by the formula: $A = \pi dh$. The bottom section, shown at upper right, is a disc having a diameter d. The area is arrived at as follows: $A = \pi / 4 \times d^2$. The blank, lower right, has a diameter D. Area is calculated: $A = \pi / 4 \times D^2$ or $\pi / 4 \times d^2 + \pi dh$.

Shown at B, Fig. 89, is layout for calculation of a circular shell having a bottom radius, r, between four and ten times the metal thickness. The diameter of the blank, D, is arrived at thus: $D = \sqrt{d^2 + 4dh}$.
At C, Fig. 89, is shown layout for calculation of a circular shell having radius r more than ten times the metal thickness. The diameter of the blank is arrived at as follows: $D = \sqrt{d_1^2 + 4(2r^2 + 1.57r d_1 + dh}$.

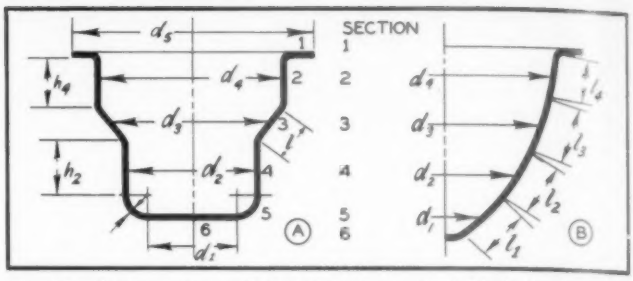


Fig. 90, showing area method for development of blank for irregularly shaped shells, such as illustrated at A, left. The area—A—is found by computing the areas of the several sections, as suggested by figures 1 to 6 at right of layout, and adding the total, thus:

Section (1) $A = \pi / 4 \times d_5^2 - \pi / 4 \times d_4^2$; (2) $A = \pi d_4 \times h_4$; (3) $A = \pi d_3 l$; (4) $A = \pi d_2 \times h_2$; (5) $A = 2\pi r^2 + \pi^2 rd/2$; (6) $A = \pi/4 \times d_1^2$.

Area of shell is total of foregoing. To obtain blank diameter D, take from a table of circles the diameter of a circle having an area equal to the total of the foregoing sectional areas. Or, by formula: $D = \sqrt{1.1273 A}$.
At B, Fig. 90, is shown layout for area of a curved section, to be arrived at as follows: $\pi d_1 l_1 + \pi d_2 l_2 + \pi d_3 l_3$, and so on through the entire range of sections.

ing is required in large quantities, and maximum stock economy is essential, the trial method should be used even though time seldom permits this to be done. Some shallow pressings require drawing to a finished depth without the use of a trimming operation. In such cases, the blank must be developed by trial.

Circular Shells

The area method can be used for circular and rectangular shells as well as for some irregular-shaped shells. Blanks for circular shells may be developed by dividing the shell into sections, calculating the area of each and then finding a circle having an area equal to the sum of the areas of all sections. If the radius at the bottom of the shell is less than about four times the metal thickness, it is ignored, and calculations are made on the assumption that the corners are sharp. However, some allowance should be made when this radium is large.

The simplest drawn shell for which to calculate the blank is the circular with parallel sides, fairly sharp corners at the bottom and no flange at the top, as suggested by Fig. 89. The blank for such a shell may be calculated by means of the following formula:

$$D = \sqrt{d^2 + 4dh}$$

In which D = dia. of the blank in inches; d = inside dia. of the shell in inches; and h = height of the shell in inches.

The above formula is derived from the sum of the areas in the sidewall section, as shown in Fig. 89, A. Should the shell radius be between four and ten times the metal thickness, as shown at B, the following formula will give reasonably accurate results:

$$D = \sqrt{d^2 + 4dh - r}$$

In which r = radius, d = diameter, and h = height.

Should the radius be greater than ten times the metal thickness, as shown at C, Fig. 89, then use the following formula:

$$D = \sqrt{d_1^2 + 4(2r^2 + 1.57rd_1 + dh)}$$

In which r = radius and d_1 the distance between radii centers.

Irregular Shells

The formulae for flanged shells—as suggested by Fig. 90 A—become rather cumbersome. In such cases, the shell should be divided into sections, as suggested by the figures 1 to 6 in the layout, with the area of each calculated by simple formula and added together. The diameter of a blank equal in area to this total may be taken from a table of areas circles, or may be calculated by the formula:

$$D = \sqrt{1.273 A}$$

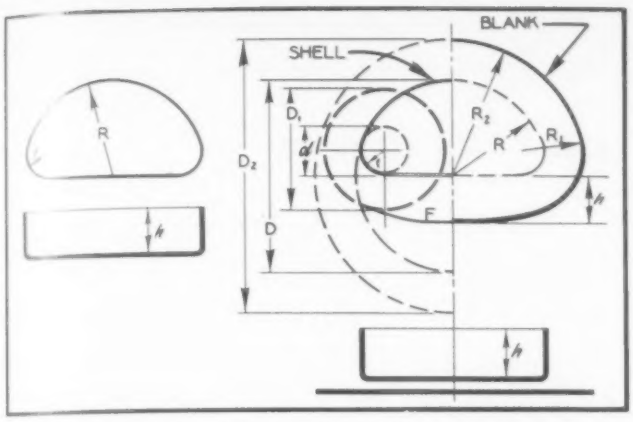


Fig. 91 shows at B, layout for calculation of the shell shown at A, left. Note, in the illustration, that one half of the shell is shown to the left of the centerline, and that half of the blank outline is shown to the right of the centerline, both in heavy lines. Note also that the shell, at A, has a major radius R, smaller radii r, and height h. These symbols are repeated on the layout B, with additional symbols R_2, R_1, d, D, D_1 and D_2. The steps of procedure are as follows:

First calculate the blank diameter of a shell having a diameter 2 times R, and a depth of h. From its center, strike a radius R_2 to obtain diameter D_2. Then calculate the blank diameter of a shell having a diameter 2 times r and a depth of h, and strike radius R_1 to obtain diameter D_1. Then draw a line, F, parallel to the straight front side, a distance h below it. Blend radii R_1 and R_2, and line F, and the resulting outline will be a fairly accurate development of the blank shape and size necessary to produce this shell. If the top of the shell must be fairly uniform in size, some modification may be necessary; however, the development suggested will make a good starting point from which a more accurate blank outline can be arrived at by trial. Formula for blank development follows, with the symbols as shown in the layout A:

For the back radius: $D_2 = \sqrt{D^2 + 4Dh.\ R_2 = D_2/^2}$
For the end radii: $D_1 = \sqrt{d^2 + 4dh.\ R_1 = D_1/^2}$
Front F: h = depth of shell.
Blend R_2, R_1 and line F.

In which A is the sum of the areas of all the sections.

Measurements of a shell similar to this may be made without need of a drawing.

It is necessary, in some cases, to make a drawing of the shell to scale in order to determine some of the dimensions of the sections. A typical shell of this type is shown in Fig. 90, A. The area of each section is calculated by multiplying the mean circumference of each section by the length of the arc. The area of the flange and bottom end are then added to the total area of the arc sections, and the blank diameter obtained as mentioned above. Layout for a curved section is shown at B, Fig. 90.

If the shell is not circular, but has a contour which can be divided into sections of circular shells, the blank outline and size can be closely approximated by calculating the blank diameter of the various parts, laying out this blank from the radii centers, and blending them together. A typical shell of this kind, shown at A, Fig. 90, has a large radius R at the back, a smaller radius r on each end, and a straight section at the front. The depth of the shell is h. The method of calculation is shown in Fig. 91, B, with formulae stated in the caption.

Rectangular Shells

Circular shells are drawn from round blanks. Rectangular shells are usually drawn from rectangular blanks, with or without the corners sheared off; however, square shells can often be made from round blanks, as shown in a previous installment. In drawing rectangular shells, the metal movement at the corners is similar to the flow in circular shells, and is more severe than at the sides and ends, which are bent to shape rather than drawn. These facts must be borne in mind when developing blanks for rectangular shells. The corners are assumed to be parts of circular shells, and are calculated accordingly. Blanks for rectangular shells may be developed by means of a scale layout and a few simple calculations. A typical example is shown in Fig. 92, with the development explained in the caption.

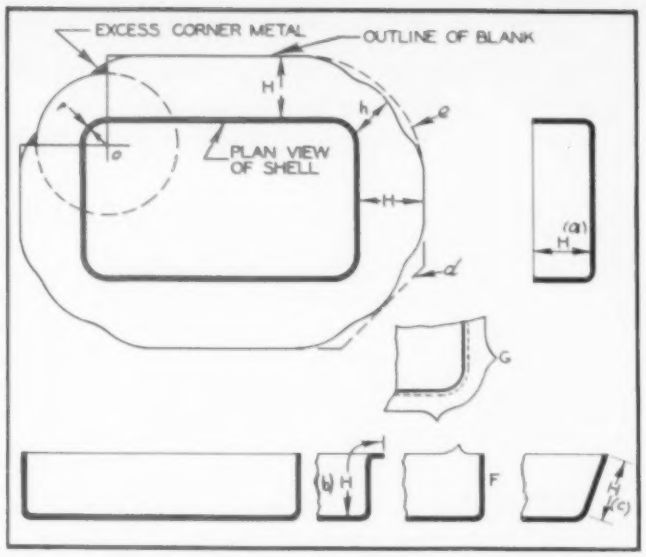


Fig. 92, showing method of laying out a blank for a rectangular shell. Development is as follows: Draw a plan view of the shell outline, the sides and ends of which are spaced a distance H from the sides and ends of the shell outline. This distance H is equal to the depth of the shell as at (a), or equal to the depth plus the flange in a flanged shell as at (b), or equal to the slope length if the shell is tapered as at (c). Th next step is to calculate the blank diameter of a shell 2r in diameter by H in depth, and draw this blank outline from the center O, then blank this arc to the straight lines of the slides and ends. This will give an approximate blank outline which can be modified by trial to obtain an exact shape. If the shell is to be trimmed, the preliminary layout may be accurate enough. In fact, sometimes the corners are just sheared off straight as shown by line d, or cut with a radius as shown by line 3. Both of these blank shapes will result in ears on the sides as shown at G. These ears, however, may be unimportant if the shells are to be trimmed. The distance h through the corner should always be less than the distance H at the sides and ends. The small shaded portion at the corner is excess corner metal, which was noted in the discussion on metal flow, to feed into the side and end area.

The Weight Method

The foregoing methods are based on surface area calculations, and may be used for the average free-drawn shells in which only minor changes in thickness have occurred in the drawing operation. However, it must be remembered that any drawing operation in which either an excessive increase in thickness occurs as a result of ironing, decreases or increases the surface area and will therefore affect the depth of the shell.

In such cases, the best method to use is the trial and error method. Extremely irregular shapes may sometimes be calculated by the weight method, providing the thickness is fairly uniform and the weight of the material per cubic inch is known. The formula is shown below, but should be used with caution and only when the shell cannot be divided into sections which can be calculated by the area method.

$$D = 1.128 \sqrt{W \,/\, w\,t}$$

In which D = dia. of the blank in inches; W = weight of the shell in lbs.; w = weight of the material per cubic inch; and t = thickness of the material.

Tables of blank diameters of drawn shells may be found in most press handbooks, as well as tables of areas of circles. Both are useful for rapidly determining the blank size for simple shapes. For the more complex shapes, the methods described may be used and will be sufficient for the majority of drawn shells.

Installment No. 11 will follow in March issue, THE TOOL ENGINEER.

34-91000

Cutting Tools and Fixtures

By A. E. Rylander

Installment No. 8 of a Series

AT THIS STAGE in the Series on Cutting Tools, a dissertation on fundamentals should serve to bridge the apparently disconnected tooling applications discussed to date, and especially as they relate to tool engineering. For instance, we have gone from lathe and planer tools, and drilling and boring tools through to milling tools without weaving these several elements into a composite picture. And in only a comparatively few instances are these tools an end in themselves; rather, each may serve but a stage in a sequence of operations taking in a wide diversity of cutting tools, manufacturing equipment and incidental work-holding fixtures.

It may be readily surmised, therefore, that it is not enough that a tool engineer be able to design, or to supervise design, for a given part or product. Among many considerations, he should have a fairly intimate knowledge of machine tools and manufacturing equipment in general, and their functions and productive capacities. Is a machine designed for carbide tooling? Is it automatic, semi-automatic or manually operated? What is its location in relation to preceding or succeeding operations on a part scheduled for production? What are its dimensions and clearances, for purpose of tool design? These and many other questions relate to the machine alone.

While it is not necessary that he have practical experience in tool or die making, it is nevertheless desirable that the tool engineer be conversant with the construction of tools and the materials used in their fabrication. Given that knowledge—and it must be eventually acquired—he can the more intelligently execute or direct tool design, or select tools from the long list of standard equipment.

He should be further conversant with the materials to be machined, and with the cutting tool material required for machining as well as with the speeds and feeds required for most economical production. Furthermore, he should have a fine sense of coordination—or say of timing—so that parts may go through the production line without interference or work stoppages resulting from serious bottlenecks.

He should also have a fair sense of processing. For while this phase of manufacture is usually delegated to a process engineer in the larger plants—usually under direction of the chief tool engineer—the tool engineer in smaller plants may have to assume the various functions usually delegated to specialists. Knowing processing, he can lay out a sequence of operations with a fair assurance that these will be coordinated in the overall production picture.

The foregoing is not intended as an answer to the perennial question: "What is a Tool Engineer?" Rather, it points to the need for a knowledge of fundamentals so that, knowing what any type of tool should do under given conditions, one can best apply that tool—or a combination of tools—to specific production problems. This knowledge further enables the tool engineer to intelligently approach the unusual job.

In Fig. 1, we show a part which, for purpose of discussion, has been specially "designed" to include a number of operations, all requiring cutting tools. Only essential dimensions are shown and, except for broad hints, there will be no attempt to portray the fixtures. However, the drawing will provide opportunity for students to process the part and to design appropriate fixtures and cutting tools. In this connection, the part is shown as a composite of two manganese bronze castings. It could as easily have been made in one piece and of cast iron or steel.

Also, depending on the quantity to be produced and the manufacturing equipment available, it could be processed through entirely different channels than those suggested in the operation sheet. Now, following this operation schedule, we proceed on a rather simple course, suggesting fixtures and cutting tools that would presume accurate workmanship with a reasonable production output. Refer to the Operation Sheet.

Note that the same fixture is used for milling the mating faces. By using two identical fixtures in tandem, one could be loaded while the other is working. An identical fixture is also used for Operations 30 and 40. As the hole spacings are alike, this only entails changing from clearance drill and spotfacers to tap drills and taps, with change to a tapping head—that is, if interchangeable crank-action multi-drill heads are used or if the machine is readily convertible.

Once the two halves are assembled, the part is readily held in a 3-jaw universal chuck for Oper. 70, and after the

OPERATION SHEET — PARTS 17322—17323

OP. No.	Operation	Machine	Tools
10	Inspect castings		
20	Mill mating faces	Horz. Miller	Fixture T-47 Face cutter
30	Drill & spotface eight 21/64 holes in vertical flanges, part 17322	2-Head Multi-drill, 8 spdls. each	Shuttle fixture T-48 Standard tools
40	Drill & tap eight 5/16-18 holes in mating flanges, part 17323	"	Fixture T-48 Standard tools
50	Assemble parts	Bench	Fixture T-49 Torque wrench
60	Drill & ream 3/8 dowel holes	2-Spdl Drill	Shuttle fixture T-50. Std. tools
70	Face bottom flanges & turn 12.375 recess	Lathe	Universal chuck Standard tools
80	Drill & spotface eight 21/64 holes, bottom flange	2-Head Multi-drill 8 spindles each	Shuttle fixture T-51 Standard tools
90	Bore hole in hub end, and face. Semi-finish 5.512 dia.; finish bore balance of diameters, and recess	Turret Lathe	Fixture T-52 Piloted boring bars. Rotary pilot bushing. Standard tools
100	Bore 2.00 cross hole	Horizontal Boring Mill	Fixture T-53 Standard tools
110	Broach rectangular hole	Hydraulic Broaching Machine	Fixture T-54 Broach T-55
120	Drill & tap four 1/4-20 holes each end of cross hole	Drill Press	Rotary Fixture T-56. Std. tools
130	Drill & tap four 5/6-18 holes in hub.	Drill Press	Fixture T-57 Standard tools
140	Drill & tap four 1/4-20 holes at broached hole	Drill Press	Fixture T-58 Standard tools
150	Finish bore 5.512 dim.	Precision Boring Machine	Fixture T-59 Diamond tools
160	Inspect		

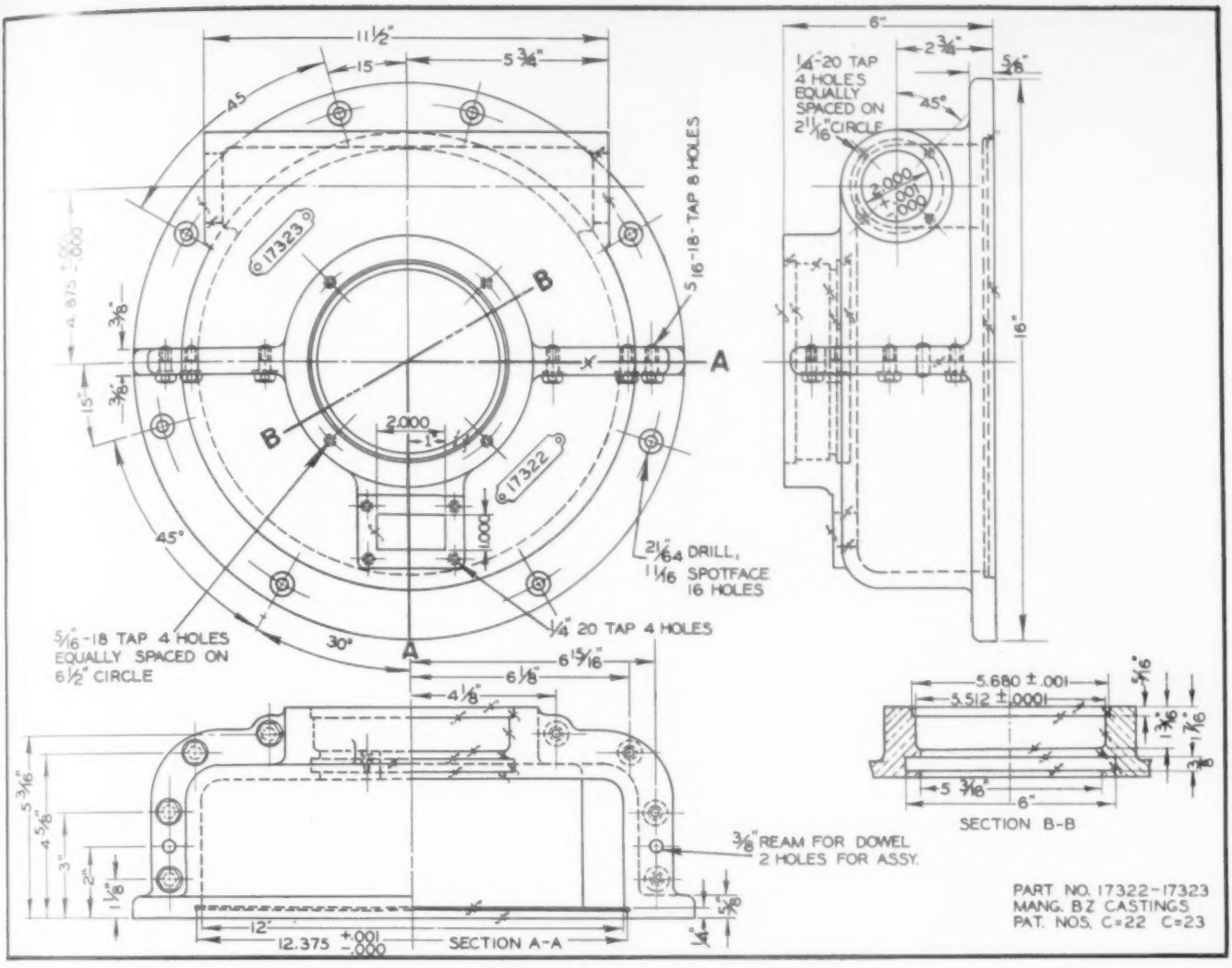


Fig. 1. The part, consisting of two mated manganese bronze castings. The operations include facing the mating flanges, assembling, facing and recessing the bottom flange, facing and boring the hub end and cross holes, broaching, drilling, tapping and spotfacing, and precision boring. While the operations are laid in sequence in the Operation Sheet, this sequence could be varied somewhat—as, for example, some of the drilling could be done as "in-between" operations. As "designed", the part calls for a diversity of machine tools and fixtures although standard cutting tools predominate.

holes are drilled in the bottom flange—Oper. 80—any one of these will serve for radial location for subsequent operations. By using shuttle fixtures for some operations, the part can be readily moved from one machining station to another.

By locating in the 12.375 in. recess, and against an accurately trued face plate—Oper. 90—incorporated in a simple fixture, the hub end can be accurately bored and faced in a turret lathe. Piloted boring bars, held in the turret and running in a rotary pilot bushing, will insure concentricity for succeeding operations. All tools, including the recessing tool for the felt seal grooves, are standard. However, the close tolerances of the 5.512 bore for a ball bearing warrants this being done on a precision boring machine. It is not essential that the other steps in this hole be in absolute alignment.

The 2.000 in. cross hole is bored on a horizontal boring mill using tools from a standard kit; however, the bar were preferably piloted in a rotary bushing, both for purpose of maintained accuracy and for long wear. This bar would carry opposed single-point cutters, with a finisher immediately following the roughing cutter as soon as the latter has cleared, and this in turn would be followed by a facing cutter. As soon as one end is bored, the machine is stopped, the first tools retracted and the opposite end machine as above. The tools could be one hand or right and left-hand, depending on whether one would cut in one direction or reverse the spindle rotation.

A simple fixture would serve for the broaching operation, and a fairly simple rotary simple fixture for the 1/4-20 tapped holes adjacent to the cross-bore, Oper. 120. For this operation, as well as Ops. 130 and 140, simple drill jigs used with a 2-spdl drill will serve adequately, one spindle being equipped with a standard tapping head.

Some exception might be taken with regard to finish boring the 5.512 in. bore as a final operation since, if spoiled at this stage in the sequences, all previous economy would be cancelled out. However, precision boring machines are so accurate that spoilage is rare; furthermore, by making this the final operation there would be little chance of marring the bore during recurrent handlings. It's as broad as it's long, as far as the operation sequences are concerned. As processed, timing for the various operations is quite closely coordinated.

In this installment, we have purposely used but one illustration. The object is severalfold: One, to provide the student with a subject for processing through various channels, as previously implied; two, to, provide a part which may be variously tooled and which would therefore be an incentive to practice in tool design; and three, to reconcile the various tools and processes that are usually incidental to the machining of parts. As previously implied, it is not enough that the tool engineer be conversant with just one phase of manufacture. Broad horizons require broad vision.

Installment No. 9 will follow in a later issue, *The Tool Engineer.*

GADGETS

Straightener for Coiled Spring Wire

While we have, at our plant, considerable use for ⅛ in. diameter rod of spring quality, it cannot usually be had in straight rods. Therefore, we purchase the wire coiled, after which we are faced with the problem removing the curvature so that reasonable straightness may be obtained. We have accomplished this in the following manner:

The operation is performed on an engine lathe, and the straightening device consists of two major parts, as illustrated. The cross slide is removed from the saddle, and in its place is set a pair of feed rolls, as shown at upper right in the drawing. These rolls are set in a stand of suitable center-height for the lathe, and in such a fashion that the lower roll has no horizontal or vertical motion.

The upper roll is supported in cartridges, either ball or bronze bearing, so as to permit adjustment in a vertical plane and therefore to exert pressure on the wire. Screws exert pressure on the cartridges. The shaft of the upper roll is extended sufficiently to clear any obstruction on the lathe saddle, and is fitted with a hand crank of about 12 in. lever length.

The deforming mechanism consists of a welded bracket containing a number of straightening rolls, as shown. With the exception of the bores for the ball bearings, this bracket is of rather rough construction. A plate, at the entry—right-hand-end has an eye for threading the wire into the rolls. On the far end is welded a stub of 1-¼ in. bar, and pressed into this is a length of ¼ in. pipe extending all the way through the headstock.

To operate, the straightener is held in the lathe chuck by means of the 1-¼ in. bar. The feed screw is then removed from the tailstock, and the wire is led through the tailstock, through the feed rolls, and then threaded into the eye of the bracket and then through the deforming or straightening rolls. The remainder of the coil is permitted to hang free behind the tailstock.

With a gap of about 9 inches between the face of the tailstock and the feed rolls, and 3 inches between the latter and the deforming rolls, the saddle is locked in position. The lathe is set to deliver a spindle speed of approximately 850 RPM, rotation counter-clockwise.

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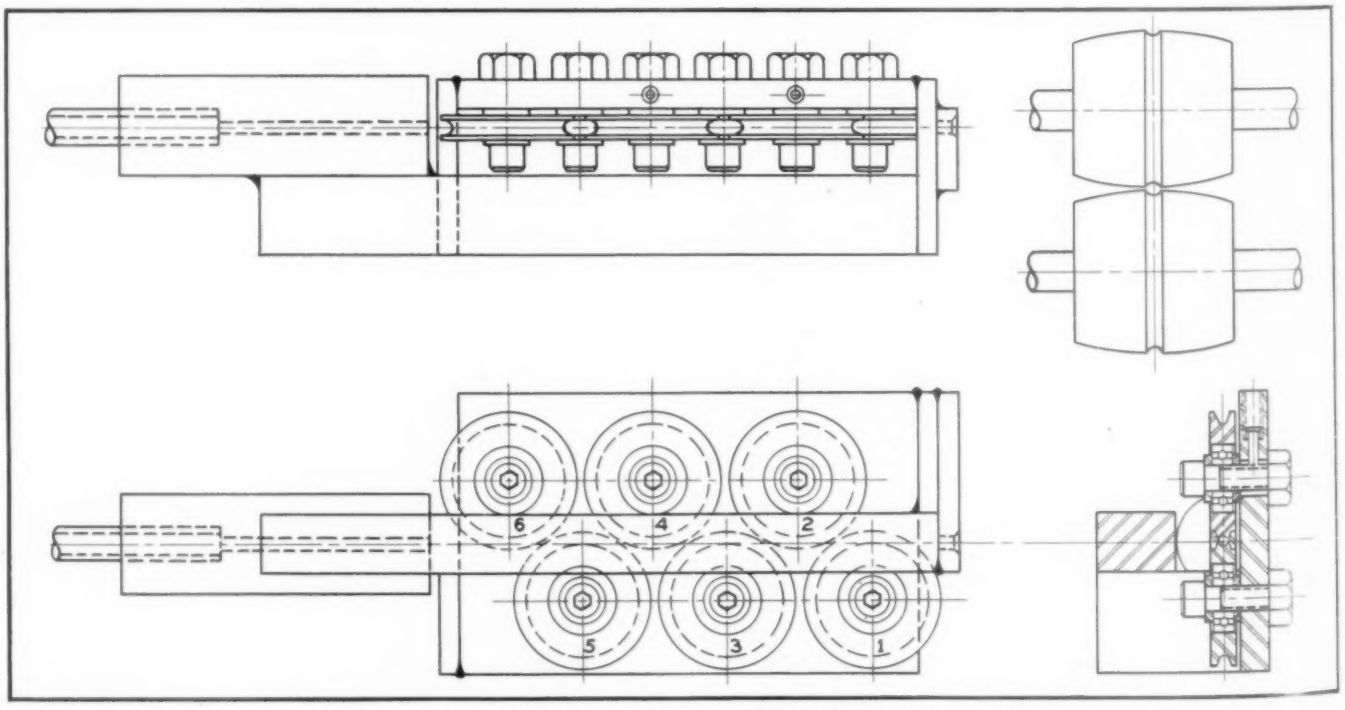
The hand-powered feed rolls are turned at a feed of about 4.3 feet per minute. The adjustment of the deforming rolls depends entirely on the curvature of the wire, and can be judged only by sight. If all of the curvature does not come out at the first setting, then screw down rolls Nos. 2 and 4 until the wire straightens. As suitable straightened lengths are obtained, they are cut off with a bolt cuter.

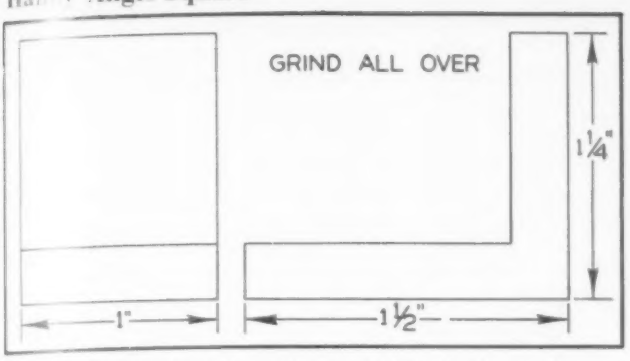
As for general details of construction, the rolls are of tool steel, hardened but not ground. They run on 8 MM ball bearings, with a 5/15 in. socket head screw serving as a shaft. A washer serves as retainer, and to maintain alignment. Rolls Nos. 2 and 4 are so arranged that the 5/16 in. screw rides in a vertically elongated slot, as shown in the cross-section. A set-screw and pin intercept this slot, to provide vertical adjustment. All other rolls are stationary, rolls Nos. 5 and 6 being purely guide rolls.

M. C. Smith
Montoursville, Pa.



Wire to be straightened moves right to left through straightening rods

Handy Angle-Square



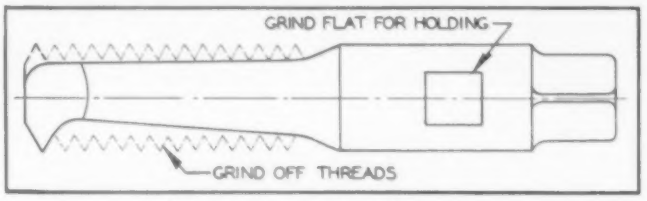
A small angle-square serves for scribing around internal and external corners.

The small angle-iron shown may be used as a square and solves the problem of scribing lines around corners, either internal or external. With the usual layout square, this is not easy to do accurately. While squares of various sizes may be made for the tool kit, increments of ½ in. provide known base dimensions for layout. The square should be hardened and accurately ground.

George Hull
Detroit, Michigan

An Improvised Boring and Threading Tool

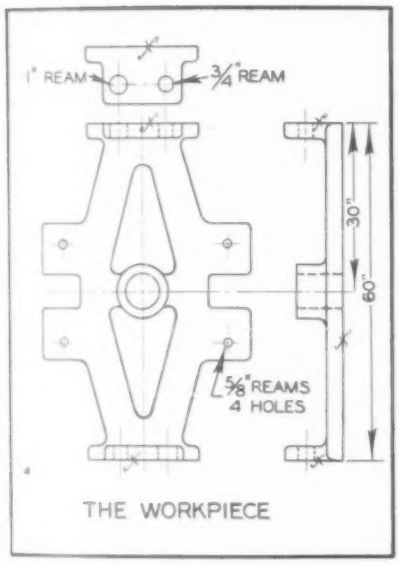
A worn tap of large pitch, for which there is little further use, can be made into a handy threading or boring tool. Any diameter tap is suitable, although it will be more rigid, when finished, if of about ⅝ in. in diameter or more. However, preparing a smaller tap this way will make it suitable for use in smaller bores. In some cases—as for large holes—the tool may be double-bit by leaving threads on opposite sides. That way, the tool can be turned half-way around, when dulled, to present a sharp cutter to the work.



Lathe threading tool made from a tap

In essence, however, the idea is to grind off all threads on the tap *but one*, right down the flute depth, trying to do an even job. This lessens the finished diameter of the tool substantially, yet not too much so, and makes a sturdy boring and threading tool of good steel.

Edward Diskavich
Torrington, Conn.



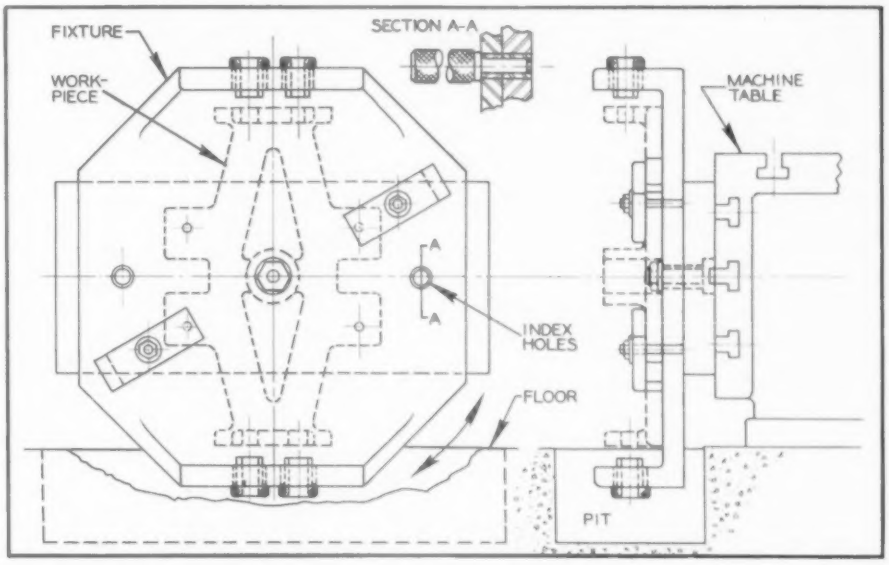


Fig. 1, at left, shows the part, Fig. 2, at right, shows the fixture as set up on the knee of a small radial drill

A Big Job On a Small Machine

An example of ingenuity in adapting small equipment to large work is illustrated in the case of a machine shop which had taken a bite ordinarily "too big to chew." Included in an order for parts were a number of castings, about 30 in. long which, in addition to other machining, required two holes to be drilled and reamed in either end—or about 30 in. from center. See Fig. 1.

Having no other machine of sufficient capacity for the job, the problem was solved by designing a comparatively simple, rotable fixture, shown in Fig. 2, and mounting this on the side face of the knee of a small radial drill. Clearance for swing of the fixture was obtained by digging a pit in the floor, adjacent to the machine table.

The fixture, which rotated on a base plate, was provided with a bushed hole located at right angles to the longitudinal axis, and this hole in turn mated with two holes in the base plate. A plug, slipped into these holes, served as an index pin. Plain drill bushings were used for the end holes to be drilled, which were first "spotted" with full-size drills and then drilled through with slightly smaller drills and then reamed.

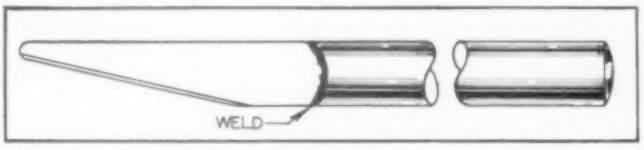
The part itself was located on the fixture by means of two of four holes, previously drilled on its face and, mating with two locating pins, and clamped by means of strap clamps. Previous machining presented no problem due to the comparative thin section of the casting.

Robert Mawson
Providence, R. I.

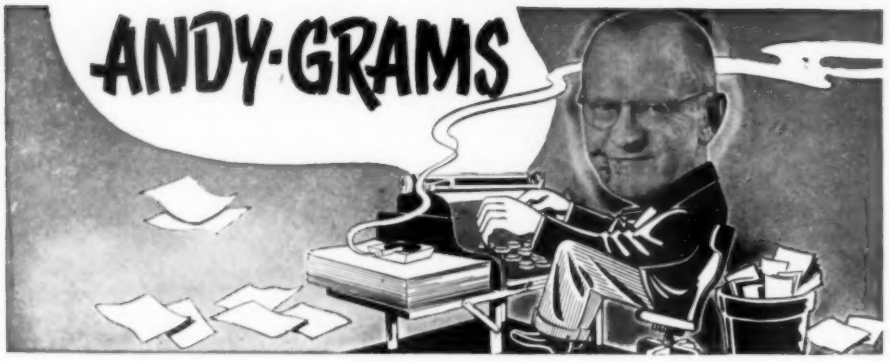
Drift for Tanged Tools

A steel bar about 1¼ in. diameter and 12 to 14 inches long is welded to the end of a drift in order that a large drill can be removed with two hands, one to catch the drill and the other to hold the drift. No hammer is needed, as the weight of the bar provides impact. In most cases, the extension provides leverage for removing the drill.

George Hull
Detroit, Mich.



A steel bar is welded to a standard drift, for leverage or impact



Like I've been saying right along, nothing ever happens until the Column's been written and gone to press. Then it breaks!—along with comments about my wrongwaycorrigan prognostications and other slips of my pick 'n' hunt system not forgetting lapses of the mind if not of the heart. Like saying last month that I wished I was back in California, which I did to make the West Coast boys feel good. And now look! In Boston the crocuses are blooming on the Common and here in Michigan the buds are on the lilacs and the birds are hunting nesting material. While in California!—but, let's not rub it in, besides which they should have plenty of drinking water come spring. (Excuse us, please! Just as this was going to the typesetter I received—from somebody in L.A. and thanks a lot—a copy of the mid winter number of the Los Angeles Times. And the gal on the front page is smothered in roses. Voila!)

Athel Denham wrote in saying that Arvid Lundell is prex, not v-prex of Colonial Broach Company, like I said in December. Okay, Arvid, as you were. Sorry about the temporary demotion but you are hereby re-promoted to original status not to mention eventual Ch'man of the Bd.

From Bill Jarvis, Connecticut River & way stations, a letter about the "universal tool" mentioned in December . . . but no, that might be confidential so we'll skip it. Anyway, a lot of the boys are of the same mind. And from Jim Kemp of Stanley Cope's School of Die Engineering, South Bend, a letter saying that they've got out a lecture and slide program on die designing for presentation at ASTE Chapters. Sounds good! Apropos which how's everybody in South Bend?

From one thing to another, I see where Boston's fair-haired boy Jim Curley is out with an idea for some 15% additional taxes on corporation earnings, re which the Wall St. J'nal goes him one better by facetiously suggesting a 100% tax, thereby going whole hog. Seems that everybody's for changing the capitalistic system, Technocrats and Tom Lawson with his all-officered blue shirt army included not to mention Uncle Joe. Trouble is, nobody goes far enough, apropos which I now offer my own pet solution for the ills of the world.

Why not let the Gov't run everything and take all the earnings, thereby doing away with income tax and withholding, oleo, excise, poll, gasoline, cigarette and luxury taxes, like the cess on women's handbags which they don't need any more than men need pockets a/c we could carry our knicknacs in a hanky which ain't taxed any more than a kangaroo's pouch. Then, let the tax collectors worry!

Everybody would have a job a/c the Gov't could put all the drones in as assistants to the workers and we'd have no insane asylums because by 'n' everybody'd be crazy. We'd stop crime because nobody'd be paid any money which, as you know, is the root of all evil barring wine, women and song which take money—and how! With wine, women and song eliminated—well, not the women, of course—and no money everybody'd be assured of life, liberty and happiness a/c there'd be nobody to stick you up in a dark alley. What'd be the use, except to get a little more of nothing from somebody with nothing. And without W, W & S, who'd care?

Y'know, I'm not saying that our present system is perfect, but its faults lie in practise rather than in theory. For one thing, it is not good that our proportion of economically dependent is increasing the while the economically independent is decreasing. And, since the latter must be taxed to help the former, we are started on a merry-go-round in which the average worker for gainful wages is trying to catch up with the HCL via the higher wage route. Only, instead of closing the gap he is forever widening it.

Now, in an entirely serious vein, our economic experts proposed about every panacea except the one that will work, and that is that the only way we can close the economic gap is for everybody who works to produce just a little more so that the unit cost will put the product within reach of a wider market. In this connection, the most ingenious tools we can design are of no value unless the men who run them let them produce to the limit of capacity. Cut down unit costs and the total will take care of itself.

As long as farmers bringing produce to town are forced to take a feather-bed rider from city limits to market, and pay him for doing nothing, and as long as certain classes of workers—some of whom do little anyway—must have stand-ins who do nothing whatsoever, the rest of us are going to keep on paying more for less. And when this condition gets rotten enough maybe an outraged public will do something about it.

Actually, free enterprise does not mean that any one individual, or any one corporation or combine corner the wealth or run hog-wild with profits. That condition has precipitated revolutions in more than one land. At the same time, there must be incentive for investment, and the more money that is doing useful work the greater the prosperity of a nation and, coincidentally, the prosperity of the people in that nation. Without adequate return, there is no incentive to invest.

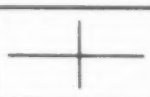
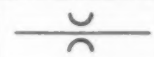
Understand, I am not throwing cold water on some of the social reforms effected in the past generation or so, nor on those now proposed. Some of these reforms, long overdue, have eliminated poverty and slums in some foreign lands, and they can do the same here if properly administered. But where these reforms work, they also go hand-in-hand with free enterprise and, I might add, with total absence of feather-bedding.

What I personally like about the free enterprise system is that the race is to the swift, in open and on the whole fair competition. About all we need to make it perfect is a place in the sun for the slow runner who tried and is still willing to put in his share of the work. As for that, it is indisputable fact that, whatever the faults of our system, the American people have more of comforts and on the whole live better than people anywhere else on our globe. Let that be the lesson for today.

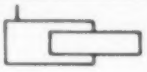
Handily yours,

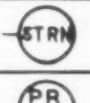
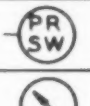
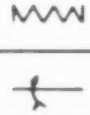
Andy

J. I. C. Standard Symbols for Industrial Hydraulic Equipment

LINES	
LINE, WORKING	
LINE, PILOT (L>20W)	
LINE, DRAIN (L< 5W)	
LINE, FLEXIBLE	
CONNECTOR (DOT TO BE 3 × WIDTH OF ASSOCIATED LINE)	
DIRECTION OF FLOW	
LINE, PASSING	
LINE, JOINING (TEE CROSS ETC) (DOT TO BE 3 × W)	
RESERVOIR (FLUID TANK)	
LINE, TO RESERVOIR ABOVE FLUID LEVEL	
BELOW FLUID LEVEL	
MANIFOLD, VENTED	
PLUG OR PLUGGED CONNECTION	X
TESTING STATION (GAGE CONNECTION)	
POWER TAKE-OFF	
RESTRICTION, CHOKE, FIXED VISCOUS	
RESTRICTION, ORIFICE, FIXED NON-VISCOUS	

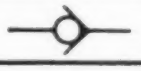
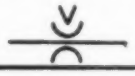
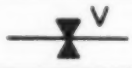
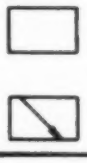
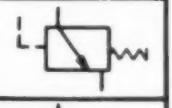
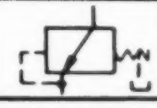
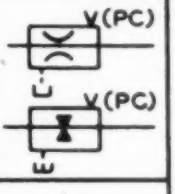
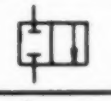
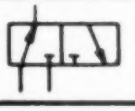
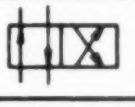
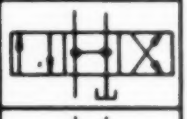
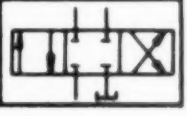
PUMPS	
PUMP, SINGLE FIXED DISPLACEMENT	
PUMP, SINGLE VARIABLE DISPLACEMENT	

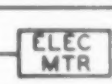
MOTORS AND CYLINDERS	
MOTOR, ROTARY FIXED DISPLACEMENT	
MOTOR, ROTARY VARIABLE DISPLACEMENT	
MOTOR, OSCILLATING	
CYLINDER, SINGLE ACTING PLUNGER TYPE	
PISTON TYPE	
CYLINDER, DOUBLE ACTING SINGLE END ROD	
DOUBLE END ROD	

MISCELLANEOUS UNITS	
MOTOR, DRIVE, ELECTRIC	
HEAT EXCHANGER	
INTENSIFIER	
ACCUMULATOR	
FILTER	
STRAINER	
PRESSURE SWITCH	
PRESSURE GAGE	
SPRING	
SHAFT, ROTATING	
COMPONENT ENCLOSURE	

Adopted by the joint Industry Conference, sponsored by Automotive Joint Industry Conference, Hydraulic Equipment Manufacturers, Hydraulic Press Manufacturers, National Machine Tool Builders Association, Resistance Welder Manufacturers Association, Tubing and Fitting Manufacturers.

J. I. C. Standard Symbols for Industrial Hydraulic Equipment

VALVE	
VALVE, CHECK	
VALVE, RESTRICTION, CHOKE VARIABLE VISCOUS	
VALVE, RESTRICTION, ORIFICE VARIABLE NON-VISCOUS	
VALVE, BASIC SYMBOL (INSERT MODEL NO. FOR SPECIAL VALVES) METHOD OF INDICATING INTERNAL FLOW	
VALVE EXAMPLES	
VALVE, MANUAL SHUT OFF	
VALVE, MAXIMUM PRESSURE	
VALVE, RELIEF REMOTELY OPERATED	
VALVE, SEQUENCE DIRECTLY OPERATED	
VALVE, PRESSURE REDUCING	
VALVE, FLOW CONTROL PRESSURE COMPENSATED VISCOUS NON-VISCOUS	
VALVE, SHUT OFF 2 POSITION-2 CONNECTION	
VALVE, DIRECTIONAL 2 POSITION-3 CONNECTION	
VALVE, DIRECTIONAL 2 POSITION-4 CONNECTION	
VALVE, DIRECTIONAL 3 POSITION-4 CONNECTION OPEN CENTER	
VALVE, DIRECTIONAL 3 POSITION-4 CONNECTION CLOSED CENTER	

METHODS OF OPERATION	
CONTROL, BASIC SYMBOL	
CONTROL, CENTRIFUGAL	
CONTROL, COMPENSATOR	
CONTROL, COMPENSATOR PRESSURE	
CONTROL, COMPENSATOR TEMPERATURE	
CONTROL, CYLINDER	
CONTROL, DETENT	
CONTROL, MANUAL	
CONTROL, MECHANICAL	
CONTROL, MOTOR ELECTRIC	
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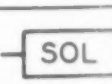
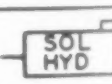
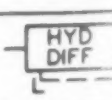
CONTROL, PILOT HYDRAULIC	
CONTROL, PILOT AIR	
CONTROL, SERVO	
CONTROL, SOLENOID	
CONTROL, SOLENOID HYD. PILOT OPERATED	
CONTROL, THERMAL	
CONTROL, PILOT HYD. DIFFERENTIAL AREA	

GOOD READING

A Guide to Significant Books and Pamphlets of Interest to Tool Engineers

MANUAL OF DIE-HEAD THREAD CUTTING, by **H. Schlarman,** is a practical, comprehensive manual on die-head threading. The book covers the basic principles of producing threads by the use of die heads, the practical application of those principles, and the causes, effects, as well as corrective factors for common troubles experienced in threading with self-opening die heads.

Beginning with the types of thread cutting equipment, the manual goes on to unusual die-head adaptations, types of die-heads and chasers, die-head troubles and maintenance. Chasers are covered, including sharpening radial, tangent and circular chasers; and general data on chaser usage. Gaging external threads, thread troubles and design factors on threads form an important section of the book.

"Manual of Die-Head Thread Cutting," 266 pages, may be obtained from the *McGraw-Hill Book Co., Inc.,* New York, at $3.50 per copy.

JIGS AND FIXTURES, by **Fred H. Colvin** and **Lucian L. Haas,** is the revised fifth edition of this volume. A standard guide, the book covers generally the design and use of jigs and fixtures, including additional material in this edition on jigs and fixtures for various machining operations.

The first section of the work covers points for consideration in designing jigs and fixtures, the advantages of standardizing in tool design features, and details of fixing design. The latter topic is treated at greater length in the following section, which covers locating schemes, vises, clamping methods, etc. Pneumatic fixtures, fixtures for milling and grinding machines, and fixtures for welding, assembly and inspection are included in the book.

"Jig and Fixture Design," 410 pages, may be obtained from the *McGraw-Hill Book Co., Inc.,* at $4.50 per copy.

PRINCIPLES OF MATHEMATICAL PHYSICS, by **William V. Houston,** is the second edition of a text designed to give a fundamental working knowledge of mathematical physics, and is written from this standpoint rather than as a treatise on the theories of physics.

Differential equations, vector analysis and mechanics are included in detail because of their absence in many cases from the college student's first few years' curricula. Thermodynamics, statistical methods, electricity and magnetism are included in the book.

Problems on the various topics are an integral part of this book, and they are presented in the belief that such correlated study of the book will provide the greatest benefit to the reader. New problems have been added in this second edition, and more detailed solutions of illustrative examples have been included.

Additional material has been provided in connection with vibrating systems, the behavior of real pendulums with finite amplitudes of oscillation, and the motion of rotating bodies; providing practical illustrations of the use of some of the methods of treatment of mechanical problems.

"Principles of Mathematical Physics," 363 pages, is available from the *McGraw-Hill Book Co., Inc.,* New York, at $5.00.

MATHEMATICS AT WORK, by **Holbrook L. Horton,** is a tool engineer's manual covering the practical applications of arithmetic, algebra, trigonometry, geometry and logarithms. Problems from actual practice illustrating these applications are analyzed and solved in an easy-to-follow procedure.

Problems are classified by groups—those illustrating some mathematical principle are presented together. In addition, a reference section consisting of five chapters provides a concise review of the fundamentals of the mathematics covered, so that where basic principles are used in the problems they can be immediately referred to if necessary.

To round out the book as a complete working manual, 145 pages of standard mathematical tables, including logarithmic and trigonometric, are included.

"Mathematics at Work," 728 pages, is available from *The Industrial Press,* 148 Lafayette St., New York 13, N. Y., at $6.00 per copy.

DESIGN FOR WELDING, edited by **R. S. Green,** acting chairman of the department of welding engineering, Ohio State University. A record of the progress made in arc welding during the post-war years, this book is composed of abstracts of 82 award papers in the recent J. F. Lincoln Foundation "Design-for-Progress" award program.

The book is important in that it represents a thorough and varied collection of welded designs for industry. In addition, it contains a liberal presentation of cost data on the various designs which afford a sound means of making a comparative study of methods.

Papers included in the book are classed according to the following categories: aircraft, automotive, railroad, watercraft, containers, furniture, structures, machinery and welderies.

"Design for Welding," 1024 pages, is available from the *James F. Lincoln Arc Welding Foundation,* Cleveland 1, Ohio, at $2.00 postpaid in the United States, $2.50 elsewhere.

The First 100 Years—an attractively illustrated history of Whitman and Barnes. This interesting book traces the story of the company from the founding in 1848 of a small business in Fitchburg, Mass., by Albert Page, to the present scope of the company. An important factor in the drop forge industry through the days of industrial expansion and railroading, W & B traces an interesting picture of growth.

The Story of the National Supply Company, a handsome 48-page history of the company since incorporation in 1894, follows, as above, the parallel growth of a company and an industry.

National Supply has been associated with the oil industry since the early 1800's, through subsidiaries such as Spang-Chalfant which go back to the days of Col. E. L. Drake and the first oil well.

SURVEY OF GEAR CUTTING CAPACITY

During the past several weeks the American Gear Manufacturers Association has mailed to its members and others over 700 questionnaires, designed to enable the association to correlate data on gearing capacity for the National Security Resources Board.

Newbold C. Goin, executive secretary of the association, announced the questionnaire embraces both a product and tools survey, which will be tabulated by the group and forwarded to the NSRB. He explained that in event of a national emergency, complete information on gear cutting capacity would be essential to avoid bottlenecks in production.

The National Security Resources Board is an advisory organization charged with keeping the President advised on industrial capacity and production potentials.

Manufacturers who have not received a copy of the questionnaire are urged to contact the AGMA at its headquarters in the Empire Bldg., Pittsburgh 22.

Pittsburgh, *workshop of the world*

Desmogged, Revitalized, It Will Show Tool Engineers Know-How, Science, Culture, during March Convention

A. S. T. E. NEWS
Doris B. Pratt
Editor

IMBUED WITH virile, young industrial and community leadership and mounting civic pride, Pittsburgh is forging ahead to rebuild itself. It has shored up old industry, brought in new ones, dry cleaned its fogs, siphoned off spring floods. It has a new look. So tool engineers will find when they meet there March 10-12 for the Society's 17th Annual Meeting at Hotel William Penn.

Besides technical information imparted during the convention, they will take home to other aging manufacturing centers enthusiasm for similar rehabilitation.

With a lineup of eight technical papers, 10 plant tours (described in later pages), a visit to a scientific institution, and a banquet, ASTE members can expect three busy days. In addition, important Society business will be transacted.

A double header will open the technical program, Thursday evening. William W. Criley, vice-president and general manager of the Ajax Manufacturing Co., Cleveland, Ohio, is to lecture on "Design of Dies for Upsetting and Forging Machines." Slides will illustrate his talk. With 30 years' experience in manufacturing upsetters and forging machines, Mr. Criley is well-informed on his subject.

William W. Walter, sales engineer for Barney Machinery Co., Pittsburgh, will chairman the session.

Another meeting will treat "Industrial Applications of Glass." Robert A. Miller, technical sales engineer in the product development dept., Glass Div., Pittsburgh Plate Glass Co., will be the first speaker. His topic is "Modern Glass Development."

In reviewing 30 years' progress in glass making, he will note advances in glass forming and describe techniques for producing bent shapes, process of laminating bent safety glass, and tempering.

Heat absorbing glass, electrical conducting glass, "one-way vision" glass and coatings for high and low reflectance will be touched on briefly. Along with all the newer developments in the glass industry, Mr. Miller will include multiple glazing and dimensional tolerances for normal glazing.

More Production with Color

"Color as a Tool" will be presented by Nelson A. Mason, manager, maintenance-painter sales, Paint Div., Pittsburgh Plate Glass Co.

Mr. Mason will consider the growing significance of color as a production factor in industry; how scientific use of color in a plant can pay dividends in increased safety, better housekeeping, higher quality, and improved employee relations. Secret of color dynamics, he claims, lies in knowing how each hue affects people. Mr. Mason has discussed this in magazine articles.

Arthur G. Crowell, tool engineer, Kerotest Manufacturing Co., will introduce Mr. Miller. J. Wesley Richards, industrial designer at Koppers Co., also of Pittsburgh, will preside during Mr. Mason's talk.

Friday evening's program is "Processing Corrosion-Resistant Steel." George A. Roberts, chief metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa., i

ASTE convention party will visit Buhl Planetarium and Institute of Popular Science, see sky show and operate exhibits demonstrating the progress of science

collaborating with Harry G. Johnstin, a metallurgical engineer in his company, in preparing a paper, "Problems in Forming Corrosion-Resistant Steel."

This paper will describe in detail tool steels normally employed for bending, stamping, shearing, forming, drawing and heading of parts made from stainless steel. It will give particular attention to special heat treatments and other controls necessary for successful application of tool steels in such instances. Examples of tools and dies used for these operations will be included.

"Techniques for Machining Corrosion-Resistant Steel," will be discussed by Malcolm F. Judkins, chief engineer, Carbide Div., Firth-Sterling Steel & Carbide Corp., McKeesport, Pa. A familiar platform figure at ASTE chapters, Mr. Judkins has appeared previously on a national program.

The meeting will be conducted by Forest F. Versaw, shop superintendent, Gulf Research & Development Co. Laboratories at Harmarville, Pa.

Will Explain Metal Spraying

Two concurrent sessions are scheduled for Saturday morning. Mechanics of metallizing and fundamental principles governing its application will be divulged in "Basic Facts Concerning Metal Spraying." Walter B. Meyer, secretary, American Metallizing Contractors Association, and manager, Metallizing Div., John Nooter Boiler Works, St. Louis, Mo., is the speaker.

He will discuss merits of various methods for bonding sprayed metal coatings, effect of operator technique in manipulating equipment, and requirements for finishing such materials. Mr. Meyer will also outline fields of application for sprayed metal coatings, and emphasize the importance of proper supporting equipment.

In conclusion he will show slides depicting techniques used, microstudies of structures, laboratory test results and representative applications. Cross-section samples demonstrating methods discussed will be exhibited.

Russell C. Niemeier, president, Barney Machinery Co., Pittsburgh, has charge of this meeting.

Headed "Fabricating Aluminum," the other concluding session will be chairmanned by Gardner Young, tool supervisor, Westinghouse Electric Corp., East Pittsburgh, and local member of the ASTE National Program Committee.

Help in Processing Aluminum

A widening use of aluminum and its alloys for items manufactured on a high production basis makes "Drawing and Spinning Aluminum and Its Alloys" a pertinent subject. E. G. Kort, Jobbing Div., Aluminum Company of America, New Kensington, Pa., will give suggestions to help tool engineers and shop personnel in tooling and fabricating these metals. In addition to procedures for drawing and spinning aluminum, Mr. Kort will talk about lubricants, equipment and tool design.

This will be followed by "Efficient Machining of Aluminum Alloys," a paper prepared by E. S. Howarth, chief, Metal Working Div., Aluminum Research Laboratories, Aluminum Company of America. He plans to explain recommended techniques and procedures in this field, pointing out benefits to be derived by departing from practices commonly employed in machining other metals. Specific examples will be cited.

Saturday afternoon the entire party will make a trip to the Buhl Planetarium and Institute of Popular Science. Here the wonders of the Universe will be revealed in a "Sky Show."

After the audience is seated beneath the dome, the theatre is darkened. At the base of the dome, a silhouette of the Pittsburgh horizon lights up. Soft music seems to drift down from the "sky."

From top: Landmark in Pittsburgh's Civic Center is the skyscraper Cathedral of Learning—University of Pittsburgh. A masterpiece of mechanical ingenuity, the Zeiss projector in Buhl Planetarium Theater of the Stars throws a grotesque shadow on the "sky." Day and night Pittsburgh's throbbing industry strains to meet America's pent-up demand for durable goods. As they ride the "Inclines," cliff dwellers have panorama of the city spread below them

From beneath the floor an elevator is silently lifting a queer dumbbell-shaped machine.

At either end of the great Zeiss projector is a steel globe fitted with 32 binocular-like units. Each consists of a lens and a thin sheet of punched copper foil. Largest of the 65 sizes of holes in the foil is only 1/30 in. in diameter.

Showing no visible ray, light passes through the openings to produce "stars" of varying size and intensity in the heavens.

Complex Gearing System

Thousands of gears keep the solar system running on schedule. By pressing buttons on a control panel, the operator can reproduce a moving image of the firmament at any given time or place. In one minute he can show all the stars visible during a 24-hour revolution of the earth.

After the show, ASTE visitors may watch the Orrery, a working model of the solar system, the Micro-Zoo—the world within a drop of water, inspect "talking exhibits" and other scientific displays.

Ladies attending the convention will visit the H. J. Heinz Co. on Friday afternoon, to see mass production cooks turn out soups, baby foods, macaroni and spaghetti, pickles, baked beans and catsup. A film will be shown and samples of food products will be served to the guests.

Chapters will send their representatives to the House of Delegates. The Delegates will hold a caucus Thursday, then meet Friday to elect a Board of Directors and to discuss chapter problems for consideration by the incumbent directors.

Meeting concurrently the Board will hear committee reports and recommendations, act on a six-months' agenda of Society business, and elect national officers.

The National Education and Editorial committees will confer on Thursday and the Committee on Professional Engineering and Honor Awards—Judicial Committee will meet Saturday. The National Program Committee will discuss preliminary plans for the convention at Montreal next fall.

High interest is expected to center around an exhibit of the "Tool Engineers' Handbook." Members and guests may preview a full-sized sample of the manual and place their orders. Delivery is scheduled for this summer.

Another attention-getter will be an impromptu meeting of the "Order of the Hounds." Founded during the Society's 1938 meeting at Pittsburgh, this exclusive group will consider applicants willing to "drag 'Snoopy' through the official convention hotel, contribute a token to the 'Hounds,' and throw one bone in the bone pit."

Snoopy, the mascot of the order, is a mechanical toy hound with sound effects. Members who have lost their prewar pups will be gratified to learn that Snoopy is back on the market.

Windup of the convention program is the annual dinner and national membership meeting. It will take place Saturday evening in the William Penn ballroom. National officers will be installed. So will '49-'50 executives of Pittsburgh chapter.

Westinghouse Executive to Speak

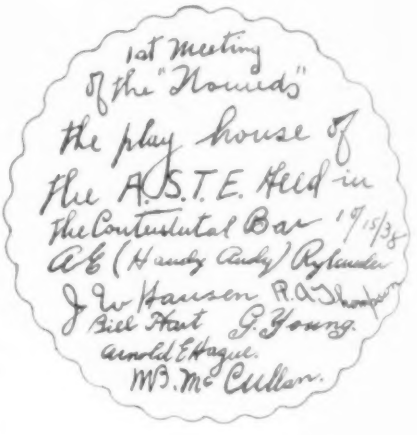
Latham E. Osborne, senior operating vice-president of Westinghouse Electric Corp., will deliver an address of economic significance, probing industry's prospects in the light of national and world affairs. When he was 16, Mr. Osborne joined Westinghouse, handing out tools from a tool crib. Now he is responsible for all manufacturing and repair units of the company. He knows production all the way between.

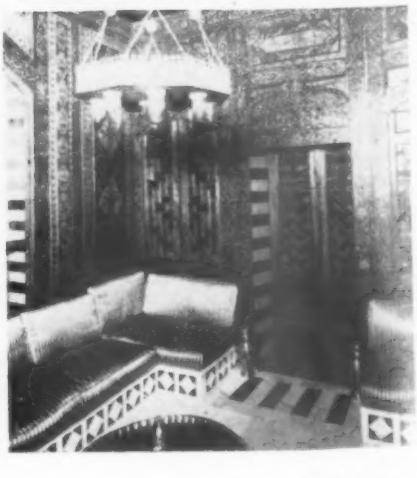
The social function will conclude with several acts of professional entertainment.

For a breather, conventioneers will cram in some sightseeing; ride tilted cable cars up Mt. Washington to see the city at night; survey it by day from atop the Gulf Building. Or stroll about the campus of the 42-story Cathedral of Learning where a shrine houses mementos of composer Stephen Foster and the world's tallest stained glass windows enrich Heinz Memorial Chapel.

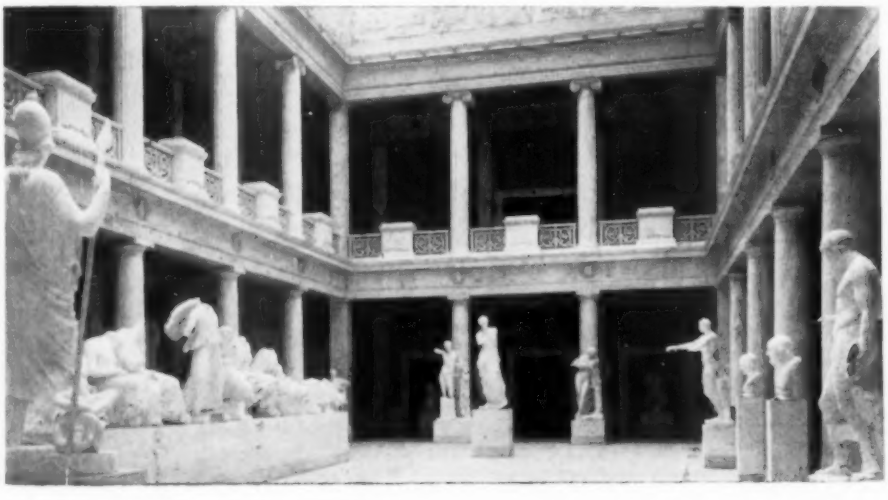
From this hub radiate Civic Center structures—Mellon Institute of Industrial Research, the Carnegie group—Institute of Technology, Art Museum, Library and Music Hall—and many others.

Everyone attending the convention will be required to register. Fee for members is $1.00; for others, $2.00. This includes admission to and transportation for all events except the banquet. Advance reservation forms for banquet tickets and hotel rooms are printed on the colored insert in this issue. Mail yours today.





Below: Hall of Sculpture in Carnegie Art Institute is gift of a Pittsburgh industrialist. Right from top: the "Hounds," founded during the 1938 convention at Pittsburgh will hold a reunion there with their mascot, "Snoopy." Ancient blockhouse at tip of the Golden Triangle is last remnant of Fort Pitt. Syrian Lebanon Room is one of a series of nationality classrooms at University of Pittsburgh, typical of culture and art of country represented.



Waiting to Welcome You to Pittsburgh

E. W. Baumgardner
Chairman
Natl. Program Com.

Gardner Young
Member
Natl. Program Com.

W. S. Risser
General Chairman
Host Chapter Com.

W. H. Schott
General Vice-Chairman
Host Chapter Com.

W. W. Walter
Chairman
Technical Program

W. B. Peirce
Chairman
Reception

J. P. Wiley
Chairman
Plant Tours

William Owen
Chairman
Banquet

D. L. Bardes
Chairman
Registration,
Reservations

J. H. Thomas
Chairman
Meetings,
Arrangements

G. C. Wood
Chairman
Emergency

J. M. Lloyd
Chairman
Publicity

P. H. Magnus
Chairman
Transportation

F. W. Hammer
Chairman
Signs

H. G. Eisele
Chairman
Records and Reports

HOW to find your way around the Golden Triangle

DOWNTOWN PITTSBURGH

1 "Block House" Old Fort Pitt
2 Joseph Horne Department Store
3 Roosevelt Hotel
4 Rosenbaum Department Store
5 Keystone Hotel
6 Frank & Seder Department Store
7 Kaufmann's Department Store
8 Gimbels Department Store
9 Chamber of Commerce Building
10 Fort Pitt Hotel
11 Pennsylvania Railroad Station
12 Greyhound Bus Terminal
13 Gulf Building
14 Koppers Building
15 Hotel William Penn
(ASTE Headquarters)
16 Pittsburgher Hotel
17 Grant Building
18 B. & O. Railroad Station
19 P. & L. E. Railroad Station
20 Boggs & Buhl Department Store
21 Buhl Planetarium

Program

17th Annual Meeting

American Society of Tool Engineers

HOTEL WILLIAM PENN
PITTSBURGH
PENNSYLVANIA

MARCH 10, 11, 12, 1949

W. B. Meyer

E. S. Howarth

M. F. Judkins

THURSDAY, MARCH 10

8:30 A.M.

Registration Opens, *17th Floor*
(Advance registration for early arrivals, from 2:00 P.M., Wednesday)

9:30 A.M.

House of Delegates Caucus, *Fort Duquesne Room*

National Education Committee Meeting, *Parlor E*

National Editorial Committee Meeting, *Parlor C*

12:00-12:45 P.M.

Plant Tours—12:00 Noon, Industrial Div., Westinghouse Air Brake Co.; 12:15, National Supply Co.; 12:30, Bronze Div., James H. Matthews & Co.; 12:45, Gearing Div.—Nuttall Works, Westinghouse Electric Corp.

8:00 P.M.

Technical Session, *Fort Pitt Room*
Chairman, William W. Walter, Sales Engineer, Barney Machinery Co., Pittsburgh, Pa.

"Design of Dies for Upsetting and Forging Machines," William W. Criley, Vice-President and General Manager, The Ajax Manufacturing Co., Cleveland, Ohio

Technical Session, *Monongahela Room*

"Industrial Applications of Glass"
Chairman, Arthur G. Crowell, Tool Engineer, Kerotest Manufacturing Co.; J. Wesley Richards, Industrial Designer, Koppers Co., Pittsburgh, Pa.

"Modern Glass Development," Robert A. Miller, Technical Sales Engineer, Product Development Dept., Glass Div., Pittsburgh Plate Glass Co., Pittsburgh, Pa.

"Color as a Tool," Nelson A. Mason, Manager, Maintenance-Painter Sales, Paint Div., Pittsburgh Plate Glass Co., Pittsburgh, Pa.

L. E. Osborne

G. A. Roberts

R. A. Miller

N. A. Mason

W. W. Criley

E. G. Kort

FRIDAY, MARCH 11

9:30 A.M.

House of **Delegates Meeting,** *Monongahela Room*

Board of **Directors Meeting,** *Fort Duquesne Room*

9:30 A.M.-12:45 P.M.

Plant **Tours**—9:30, Combined tour, Carbide Div., Firth-Sterling Steel & Carbide Corp., and Irvin Works, Carnegie-Illinois Steel Corp.; 9:45, Gulf Research & Development Co. Laboratories; 11:00, East Pittsburgh Works, Westinghouse Electric Corp.; 11:45, New Kensington Plant, Aluminum Company of America; 12:00, Industrial Div., Westinghouse Air Brake Co

1:30 P.M.

Ladies' **Tour**—H. J. Heinz Co.

8:00 P.M.

Technical Session, *Urban Roof*

"Processing Corrosion-Resistant Steel" Chairman, Forest F. Versaw, Shop Superintendent, Gulf Research & Development Co. Laboratories, Harmarville, Pa.

"Problems in Forming Corrosion-Resistant Steel," George A. Roberts, Chief Metallurgist, Vanadium-Alloys Steel Co., Latrobe, Pa.

"Techniques for Machining Corrosion-Resistant Steel," Malcolm F. Judkins, Chief Engineer, Carbide Div., Firth-Sterling Steel & Carbide Corp., McKeesport, Pa.

SATURDAY, MARCH 12

9:30 A.M.

Meeting, Committee on Professional Engineering, *Parlor D*

Honor Awards and Judicial Committee Meeting, *Parlor B*

10:00 A. M.

Technical Session, *Fort Pitt Room*
Chairman, Russell C. Niemeier, President, Barney Machinery Co., Pittsburgh, Pa.

"Basic Facts Concerning Metal Spraying," Walter B. Meyer, Secretary, American Metallizing Contractors Association; Manager, Metallizing Div., John Nooter Boiler Works Co., St. Louis, Mo.

Technical Session, *Monongahela Room*

"Fabricating Aluminum," Chairman, Gardner Young, Tool Supervisor, Westinghouse Electric Corp., East Pittsburgh, Pa.

"Drawing and Spinning Aluminum and Its Alloys," E. G. Kort, Jobbing Div., Aluminum Company of America, New Kensington, Pa.

"Efficient Machining of Aluminum Alloys," E. S. Howarth, Chief, Metal Working Div., Aluminum Research Laboratories, Aluminum Company of America, New Kensington, Pa.

2:00 P.M.

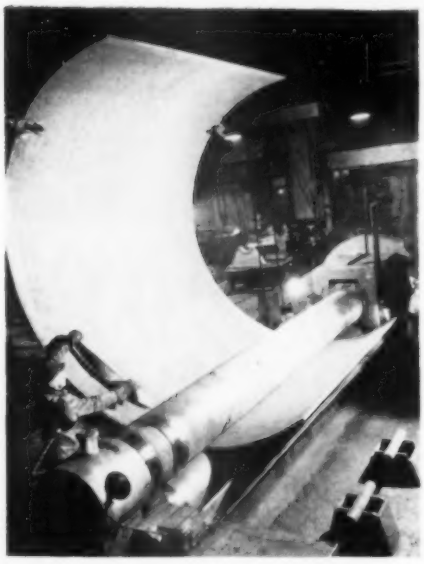
Tour and Sky Show, Buhl Planetarium and Institute of Popular Science

7:00 P.M.

Annual Dinner and National Membership Meeting, *Ballroom*
Installation of National Officers
Installation of Pittsburgh Chapter Officers

Address by Latham E. Osborne, Senior Operating Vice-President, Westinghouse Electric Corp., East Pittsburgh, Pa.

Entertainment



F.O.B. PITTSBURGH

ASTE Members to See Booming Steel Center at Work

THE ILL wind of the Supreme Court's steel pricing decision is blowing millions in new industrial investment into the Pittsburgh area. During 1948 it welcomed 50 new plants. Much of the influx is traceable to this factor, since Pittsburgh is the principal center of U.S. steel production. For tool engineers, the ASTE convention there is a timely opportunity to view facilities of some of the country's leading makers and fabricators of steel and other metals.

Massive Metal Processing

Among the most spectacular on the convention plant tour schedule will be giant metal working operations at the East Pittsburgh Works of Westinghouse Electric Corp. Here huge generators and hydro-electric equipment are manufactured for power projects such as Grand Coulee Dam, as well as motors for industry and transportation.

Highlights will include assembly and testing of large oil circuit breakers; fabricating, assembly and welding of metal clad switchgear; winding of stators and fabricating of motors and generators; rolling of bars and plates up to 10 in. in thickness and 190 in. in width; and machining of motor parts and housings.

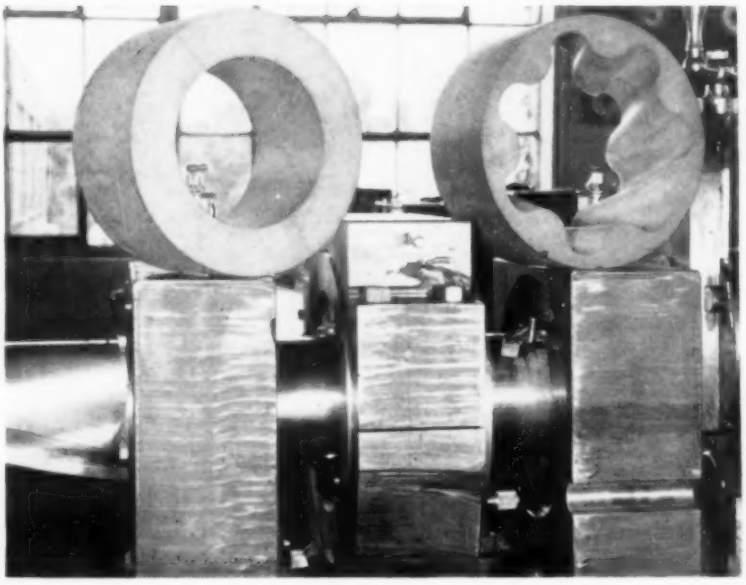
Shafts Machined on 96 in. Lathe

Layout on sheet metal work is eliminated by a 32-station Weideman punch press. An Ingersoll boring mill, with a horizontal travel of 30 ft and a vertical movement of 12 ft, machines large fabricated pieces and castings for waterwheel generators. Shafts for these installations are turned on a Bethlehem 96 in. engine lathe with overall length of 67 ft.

Another Westinghouse division—the Nuttall gearing plant—is entirely devoted to machine work and incidental handling of gears, predominately spur, single, helical or herringbone. Over 400 machine tool setups are in constant use, producing gears from one inch to 12 ft in diameter.

Visitors will see the manufacture of open and enclosed gear drives for indus-

From top: Steel plate is rolled at the East Pittsburgh Works of Westinghouse Electric Corp. to form a frame shell for power plant equipment. Workers at James H. Matthews & Co. roll a cope. Others hand-chase lettering on bronze castings. Cutting of helical supercharger gears on shaper is part of machining operations at Gulf Research & Development Co. Laboratories. Right: Engineer in foreground follows a laboratory test on an experimental oil



trial and mill drives; transportation gearing for subway and surface cars, aviation gas turbines and diesel-electric powered ships and locomotives; and high speed units for centrifugal applications.

How ribbons of flat steel skelp are transformed into lapweld pipe, how steel coils are progressively joined, heated, formed, welded and cut into 21 ft lengths of continuous weld pipe in uninterrupted operation will be demonstrated at Spang-Chalfant Div. of National Supply Co.

Pipe is threaded in high speed machines of special design, combining precision, accuracy and cleanness of threading. The plant's galvanizing process is considered highly developed. Finishing of black enameled, electroplated, and hot dipped electrical conduit also will be observed.

To See Carbides Made

Firth-Sterling engineers will guide visitors through powder metallurgy departments of the steel and carbide division, pointing out each step in making sintered carbides from tungsten and cobalt.

In the tool and die shops, special tool work will be shown as well as shank milling, tip brazing, grinding and inspection. ASTE guests will inspect also casing, drilling and finish polishing of wire drawing and heading dies.

Open house will be held at the "Mill on the Hill" Irvin Works, newest sheet and tin plate mill of Carnegie-Illinois Steel Corp. The ASTE party will watch a 10-stand tandem, 80-in. hot strip mill reduce glowing slabs to coils and sheets, then tour the cold reducing and finishing departments, a 21-stack tinning house, and three lines of electrolytic tinning.

From engine testing to entomology, laboratory workers at Gulf Research & Development Co. will carry on painstaking experimentation in developing oils and fuels for industrial, automotive, marine, aviation, domestic and agricultural applications.

Cutting Oil Tests

Of prime interest to tool engineers will be the machine shop where nearly all non-glass equipment is built by highly-skilled instrument makers. Lubricants and cutting fluids are constantly tested in machining operations.

Laboratory exhibits include apparatus to study properties of oils and greases under controlled speeds, loads and temperatures.

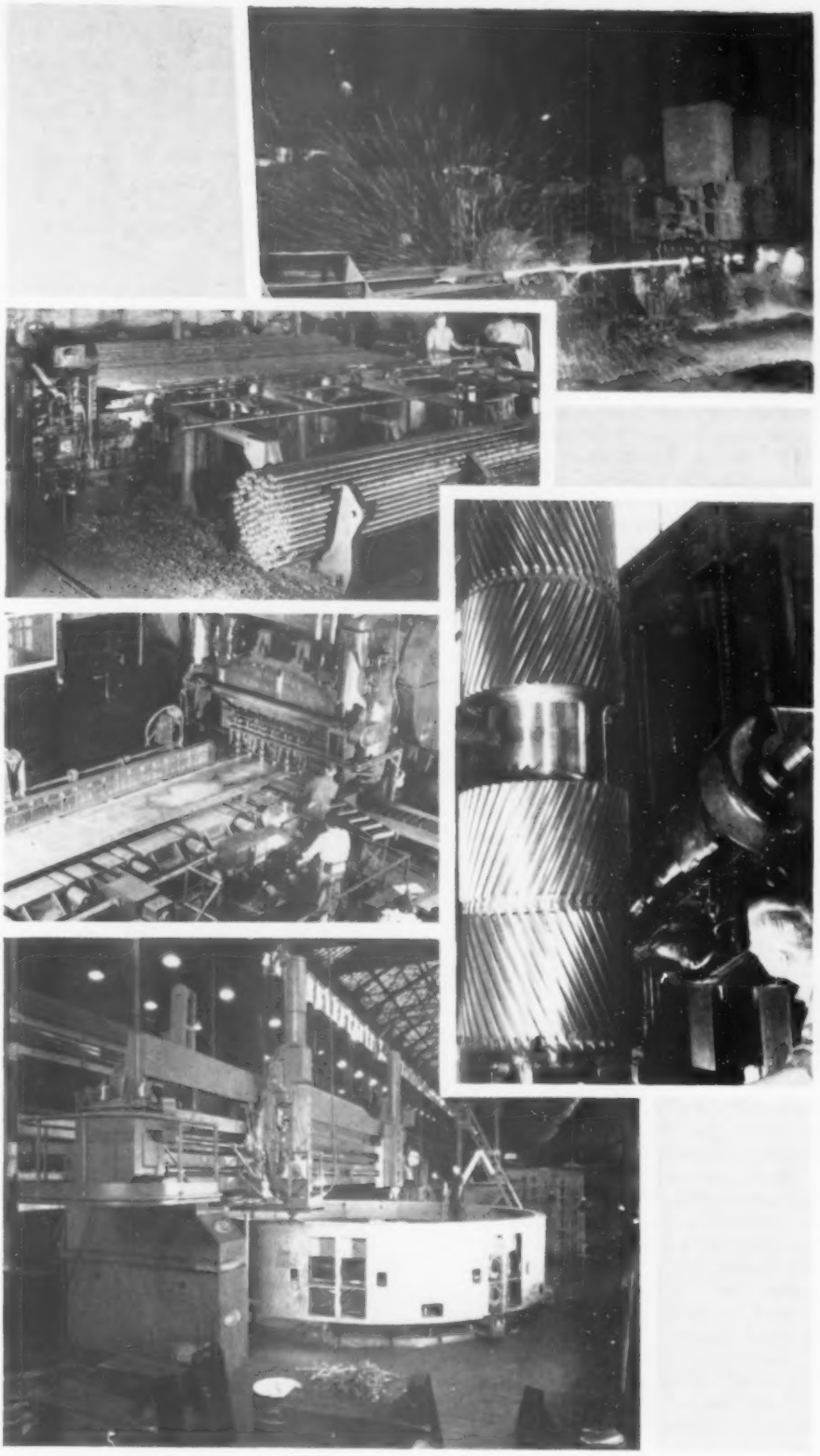
Iron, brass and aluminum foundries operating with the most modern equipment for making small and medium-sized castings will be inspected at Westinghouse Air Brake Co. Outstanding in this division is the core making department employing some 600 people.

Besides extensive machining operations, brass forging and the making of rubber gaskets and compression cups are high spots in this visit.

Aluminum Company of America will open its program by showing a motion picture of an experimental high-speed lathe for machining aluminum. This lathe is equipped with an 80 hp high-cycle electric motor drive. Its spindle can be operated at stepless speeds up to 8800 rpm.

Following the film the lathe will be demonstrated, turning aluminum alloy at cutting speeds up to 10,000 sfpm while removing metal at more than 400 cu in. per min. Finally the group will be conducted through the company's central machine shop, occupying 85,000 sq ft and producing tools, machines and equipment for operating all of the firm's plants.

Somewhat unusual will be the trip through the memorial bronze division of James H. Matthews & Co. The tour will lead through the art and pattern departments to such shop operations as melting and pouring bronze, molding, and finishing by belting, polishing and chasing.



From top: As it emerges from forming and welding rolls and proceeds to cooling unit, continuous weld pipe at Spang-Chalfant plant of National Supply Co. throws a fiery spray. Using tungsten-tipped tools and a dry cut, this machine automatically reams, faces and chamfers pipe. Tool engineers will watch operation of this plate shearing line at Irvin Works of Carnegie-Illinois Steel Co. Westinghouse machines a water wheel generator frame with a 40-ft boring mill. Right: A large herringbone pinion shaft for a rolling mill drive is hobbed at Westinghouse Nuttall Works

Manhattan Tooling Forum Features Member Talent

New York City—Is the tool or methods engineer earning his keep? When does tooling start—and stop? What can be done about improper tolerances, material specifications? What about production control, quality control?

Answers to these questions were given by several speakers participating in a panel discussion presented December 7 by Greater New York chapter.

Members appearing on the program included Harry Fink, president, Halex Corp.; William Lentz, works manager, American Machine and Foundry Co., and chapter chairman; Adolph Moses, mechanical engineer at Trubenizing Process Corp.; James L. Fitzpatrick of Fitzpatrick Co.; Carl Kertesz, president, Die Jig Corp., and chapter treasurer; and William Zieve, owner of Wil-Tex Mills.

Chapter Chairman Lentz introduced Education Chairman Fitzpatrick, chairman for the evening, who opened the forum by discussing procedures in introducing a new product or changing the design of an existing product. He outlined both the horizontal and vertical system in management, stressing the importance of doing the right thing in the right department.

Tooling Requires Good Judgment

Quantity to be produced should be decided by the product design engineer, not left for the tool engineer. The latter, however, should be responsible for the proper tooling, neither economizing by skimping on tools nor being extravagant by designing unnecessary tools.

Mr. Fink talked on tools and methods, emphasizing the importance of tolerances and their significance, including how temperature and day and night affect given tolerances.

Market research, spoilage, mill overhead, sales and service costs were the theme of Mr. Lentz' remarks. Product design engineering was Mr. Moses' topic.

Mr. Kertesz presented tool making and tool purchasing, and Mr. Zieve spoke on the maximum utility of machines.

Prior to the forum Jay K. Wohlfeld and Harold Granger of the Bellows Co., Akron, Ohio, showed a sound film describing air motors and their application in modern industry, ranging through feeds and wheel presses, milling machines, and punch press work applications, as well as fine control devices for checking lathe turning operations.

Windsor Hears Lee

Windsor, Ont.—Ralph L. Lee of the Public Relations Dept., General Motors Corp., appeared before Windsor chapter, December 13, to discuss "Humanics in Engineering." Held at the Prince Edward Hotel, the meeting was well attended and included a group from Wallaceburg. Refreshments suitable to the holiday season were served.

C. G. Sampson of the Ford Motor Co. of Canada, Ltd., was welcomed on his return from an extensive business trip to Australia and New Zealand.

DCAS Student Section Gains 35% in First Year

Detroit, Mich.—Detroit chapter's new student section at the Detroit College of Applied Science has completed a year of successful operation, with its original membership of less than 50 increased to 67.

Active in the organization of the group, formally launched last March, were Lee Linzell and Elmer Szanto, DCAS students who were already Society members; Education Chairman George F. Bush, Leslie Bellamy, Andrew Carnegie, Herbert Bachman, and the late George Koch, of Detroit chapter. The college faculty also supported the movement.

Established under the direction of the chapter Education Committee, the student section has its own officers, without official Society recognition. They are: A. R. Conrad, chairman; Mr. Linzell, vice-chairman; Henry Knight, secretary; and Mr. Szanto, treasurer.

Activities are financed by the chapter, with all expenditures approved in advance by the Education Committee.

Speakers for technical meetings are selected jointly by the student officers and the chapter Education Committee. The latter group approaches the lecturers and the students handle arrangements. A welcoming committee meets the guest speaker and escorts him about the school before the meeting.

In its program planning the section is fortunate in being able to draw upon the parent chapter for qualified experts heard on the national circuit.

One guest lecturer, L. G. Bradley, president of Bradley Machinery Co., learning that the school did not have a Rockwell hardness tester, presented an old one. Eclipse Counterbore Co., through Mr. Bush, offered another. Using parts of the two discarded instruments, the students expect to make one good tester.

The chapter plans to organize similar student sections in other local institutions of higher learning. Their experience with the DCAS group convinces them of the value of such an educational program not only to the students, but also to the chapter and the national organization.

Officers of DCAS section of Detroit chapter have led group successfully through first year. From left: Ernest Ladinig, education chm.; Albert Conrad, chm.; Elmer Szanto, treas.; Henry Knight, secy.; Roger Gamache, program chm.

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Hartford Tool Engineers entertain their ladies with a dinner and dance at the Indian Hill Country Club

Society Officers Appear On Technical Program

South Bend, Ind.—In December South Bend chapter met at the Mayfair Restaurant in Mishawaka, to hear H. B. Osborn, Jr., technical director and sales manager, Tocco Division of Ohio Crankshaft Co., Cleveland, Ohio, and H. L. Tigges, executive vice-president and sales manager of Baker Bros., Inc., Toledo, Ohio. Mr. Osborn told "What's New in Industry," and Mr. Tigges discussed "The Tool Engineer, His Importance to Our Economy."

Mr. Osborn is national public relations chairman and Mr. Tigges, second vice-chairman of the Society.

Skilled labor, demand, knowledge and machines make the United States the best qualified nation to carry on the world's technical progress, said Mr. Osborn. America, he added, is now exporting more goods than ever before, besides technical men, "know-how" and equipment. The latter group of exports will soon enable other countries to begin competing with us in world markets. Only by constant research, he warned, will we be able to maintain our leadership.

As examples of our continuing industrial development, the speaker cited use of automatic welders, automatic molding equipment, thread rolling, injection molding, press forging, induction hardening and application of carbides.

Analyzing an imaginary commodity requiring more than 200 machine operations, Mr. Tigges compared costs on both job and production basis, emphasizing the importance of the tool engineer. He also related certain activities of the National Security Resources Board, with which he is associated, as they affect industry.

'Goofy Gadgets' Amuse Ladies Night Audience

Indianapolis, Ind.—Russell E. Oakes, self-styled "inventor extraordinary," entertained 105 members and guests of Indianapolis chapter at their annual ladies night dinner dance, December 2, in the Athenaeum Turners Hall.

Mr. Oakes demonstrated numerous laugh-getting devices of the Rube Goldberg variety. Described as the "crowning point of my inventive career" was his hydraulic cigarette lighter.

Chairman Clarence Wetzel welcomed the gathering and Second Vice-Chairman R. F. Krause served as toastmaster.

Speedway Head Relates Hazards of Racing

Muncie, Ind.—Technical sessions gave way to holiday festivities when Muncie chapter held its third annual Christmas dinner party and ladies night at the Top Hat, with 110 persons attending.

Following dinner William Brown, chapter chairman, introduced guests of the occasion: George O. Desautels of the George O. Desautels Co., Indianapolis; Roy Plummer, general manager, Delco-Battery Operations, Muncie; and John Coyle, general manager, Chevrolet-Muncie.

Mr. Coyle briefly reviewed General Motors' progress in the automotive field, then presented the guest speaker, Wilbur Shaw, president of Indianapolis Motor Speedway. Mr. Shaw humorously unfolded a narrative of a race in which he wrecked one car, was treated for minor injuries, then continued in another auto, only to lose the race.

A color film made by Firestone Tire and Rubber Co., incorporating the history of the Speedway with all its trials and disappointments, preceded Mr. Shaw's talk.

Air Chucks Raise Output, Reduce Cutter Breakage

Racine, Wis.—The high speed and cutting efficiency of modern machines make it imperative that holding fixtures progress from manually operated to the automatic type, according to E. B. Rhodes, industrial sales representative of Bendix-Westinghouse Automotive Air Brake Co., Elyria, Ohio.

Lecturing on "Air Operated Holding Devices" before Racine chapter, December 6, Mr. Rhodes pointed out that jigs and fixtures incorporating roto and diaphragm type air chucks have increased production and reduced cutter breakage. An ordinary plant pressure line is sufficient to operate these air valves, he added.

Mr. Rhodes presented a sound film on automotive air brakes with a working diagram and cutaway drawings of the compressor and air valves, their operation and mechanics. This was followed by slides on Robotair laborsaving applications for air-operated holding devices.

A social hour and dinner preceded the meeting at the Manufacturers Association Building.

Quality Control Claimed 99.7 Percent Accurate

Hartford, Conn.—"What Every ASTE Member Should Know About Control of Costs and Quality Through Statistics" was presented to 220 Hartford members and guests by Dorian Shainin, chief inspector, Hamilton Standard Propellers, Div. of United Aircraft Corp.

Mr. Shainin was the principal speaker at a technical session held December 6 in Hartford Gas Company Auditorium. He urged instructing operators to work with graph tolerance control charts, for economy in eliminating scrap and rework.

Proved in Practice

Mathematical formulas, he stated, used in the production of goods and tools have averaged 99.7 percent accurate in some 2000 factories across the country.

Dinner at the City Club preceded the technical session. Following the dinner Wayne M. Pierce, Jr., vice-president, Tey Manufacturing Corp., Milford, discussed "Tooling Problems Encountered in the Manufacture of Laminated Metal Skis."

Guests introduced by Chairman William Jarvis included: John L. Petz, past chairman, L. H. Tenney, chairman, and E. W. Thorp, second vice-chairman, of Mid-Hudson chapter, Poughkeepsie, N.Y.; and A. R. Hunt, a former chairman of Fairfield County chapter, Bridgeport, and president of Tey Manufacturing Corp.

* * *

Approximately 190 tool engineers and their wives, from Hartford and the surrounding area, gathered recently at Indian Hill Country Club for the chapter's first ladies night dinner and dance.

After dinner and musical entertainment there was a drawing of door prizes for the ladies. Card games were enjoyed by those who did not dance.

Weller Accepts New Post

Toledo, Ohio—Perry R. Weller has joined the Perfection Steel Body Co. of Galion, Ohio, as plant and tool engineer.

Previously Mr. Weller was planning superintendent at Garwood Industries, Inc., Findlay. In his new position the Toledo ASTE member will be active in plant layout, expansion and tooling.

Representatives of the National Program Committee were guests at December meeting of Pittsburgh chapter, to discuss plans for the Annual Meeting there next month. From left: W. S. Risser, chapter chairman; K. N. Macomber of Lapointe Machine Tool Co., technical speaker; E. W. Baumgardner, national program chairman; F. J. Schmitt, first vice-chairman; and H. M. Windsor, headquarters secretary to the committee; and H. L. Harper, secretary of chapter

Merits of Belt Grinding Shown in Motion Pictures

St. Louis, Mo.—Tool engineers in the St. Louis area learned about the versatility of belt grinding when H. A. Gawler of Porter-Cable Machine Co., Syracuse, N.Y., described applications in their field. Mr. Gawler was the principal speaker at a meeting, December 2, attended by approximately 160 members and guests of the local chapter.

Phases discussed included the development of wet belt grinding, fixtures used, precision and finish obtained with this method, contour grinding and centerless grinding.

With three films he proved the merits of these methods. Wet belt grinding was shown to produce fast, accurate finishes on materials ranging from glass to relatively soft plastics.

Heavy Clamping Eliminated

For contour grinding, suitably shaped rolls are used behind the belt instead of the flat plate used for straight line grinding. Simplicity of the work holding fixtures was of especial interest. Since no heavy clamping is involved, loading and unloading are facilitated, and possible distortion of thin section work is eliminated.

* * *

An audience of 245 turned out for the previous dinner meeting to hear R. F. Moore, president, and Fred Victory, chief engineer of Moore Special Tool Co., Inc., Bridgeport, Conn. Their subject, "Grind It," included all phases of grinding, tools and dies, and examples of difficult grinding jobs.

In their well-organized program, the speakers explained benefits of present grinding standards and techniques in meeting increased competition and rising costs of tool work and production grinding operations. Blowups of sketches enabled the group to visualize the procedures and tools discussed.

Prior to the technical session W. G. Callies showed a color film of the chapter's summer picnic. Mr. Callies and D. R. McGary made the motion picture.

Willis Ehrhardt reported highlights of the Los Angeles convention. The Society's building fund certificate plan was outlined by H. M. Creasey, chapter chairman. The chapter has subscribed for a $500 certificate.

Program Committee Visits Convention Host Chapter

Pittsburgh, Pa.—An all-day joint meeting of the National Program Committee and the Pittsburgh chapter convention committee preceded the December 3 dinner meeting of the chapter.

Arrangements for the Annual Meeting in March at Hotel William Penn were discussed and the following representatives of the National Program Committee were introduced: E. W. Baumgardner, chairman; F. J. Schmitt, first vice-chairman; H. M. Windsor, secretary to the committee; and Gardner Young, a chapter member.

For the technical program a film lecture, "Tooling for Jet Propulsion," was presented by K. N. Macomber, chief engineer of Lapointe Machine Tool Co.

Motion picture sequences showed broaching machines being used to slot turbine wheels and the broaching of locking ends of turbine blades and buckets. In a film on "Surface Broaching," automotive cylinder blocks were given final broaching operations for close tolerance surfaces. Each case history demonstrated economies in time and money, along with the fine finishes obtainable with broaching.

Mr. Macomber briefly described "Electrolizing" wherein a layer of hard material is deposited on the cutting edges of broaches and cutting inserts.

Following the lecture he invited questions from the 120 men present.

Exhibits Samples Of Liquid Honing

Syracuse, N. Y.—Verne Nichols of the Vapor Blast Equipment Co. addressed 70 members and guests of Syracuse chapter at a meeting December 14 in the Onondaga Hotel.

In an informative talk on the liquid honing process, Mr. Nichols explained basic principles of the process and its uses in industry. Samples displayed ranged from cutting tools, watch springs and automobile accessories to airplane cylinders.

A motion picture of the Graziano-Zale bout was shown.

Chairman Lester Collins opened the meeting and conducted a brief business session. First Vice-Chairman Fay Adkinson introduced the speaker.

Marble Processing Tools Compared with Ancients'

Springfield, Vt.—Marble working through the Greek and Roman eras, as revealed in Bible passages, was narrated and compared with modern practices for 61 members and guests of Twin States chapter.

Addressing the chapter's December dinner meeting at the Windsor House in Windsor, Henry A. Collin, chief engineer of the Vermont Marble Co., Proctor, went on to describe his company's wartime problems in converting to the machining of iron and steel.

Through New England ingenuity, the firm was able to adapt marble processing machines, many of its own design and construction, to the machining of heavy castings and steel parts. This accomplishment for the war effort, together with the company's personnel training in this field, has had nationwide recognition.

Vermont Once Submerged

In tracing the geologic formation of marble, Mr. Collin related how eons ago the Green Mountain area from the St. Lawrence to the mouth of the Hudson River was under water. During this period minute shell fish and other lime-producing marine life began building marble beds.

Through the ages, shifting of the earth's crust raised the mountains now known as the Taconic Range, displacing water with peaks and valleys and creating a new Atlantic shore line.

The first marble quarry in Vermont, said Mr. Collin, was opened at Dorset in 1785; by 1901 West Rutland and Proctor had become the center of the marble working industry.

A color-sound film produced by the Vermont Marble Co. showed each step in the manufacture of interior decorative marble slabs, monuments, and carved work. A question and answer period followed the lecture.

At the close of the meeting another sound film, "Miracles of Air Power," was presented by representatives of the Bellows Senacon Co. of Akron, Ohio.

William Hadfield, chapter chairman, presided, and Lee Davis, first vice-chairman, introduced the speaker.

Ladies Feted with Party

New Haven, Conn.—One hundred and thirty members and guests gathered at New Haven Country Club, December 10, for the chapter's annual Christmas party and ladies night. Toastmaster was A. V. Pollard, chapter chairman.

Entertainment included accordion and piano selections and legerdemain. Group singing of Christmas carols was led by George F. Westerman, and a film, "Tobacco Valley," was shown. Several door prizes were awarded.

Distinguished guests included I. F. Holland, Society president; V. H. Ericson, third vice-president; F. J. Dawless, national membership chairman; and A. H. d'Arcambal, a former president. Mr. Holland, Mr. Ericson and Mr. Dawless spoke briefly during the evening.

Auto Executive Finds Australians Industrial Minded

Windsor, Ont.—Spurred by their government, Australians are developing a modern industrial machine, according to Cecil G. Sampson, general superintendent of Ford Motor Co. of Canada, Ltd., and a former chairman of Windsor chapter, ASTE.

Mr. Sampson is just back from a 10 weeks' business trip to Australia and New Zealand. His mission was to correlate company branches with the parent plant and to survey manufacturing facilities generally.

While "down under," the Canadian automobile executive visited the main Ford manufacturing plant in Geelong, near Melbourne, and assembly plants in Sydney, Brisbane, Adelaide and Perth.

Production Includes English Cars

Employing 3600 workers, the five factories turn out Fords and two small English cars—the Prefect and Anglia. Assembly lines are well mechanized "but do not compare with the largest in the United States, since production is on a limited scale."

Body stampings are made at Geelong. Motors, transmissions and axles are sent from Canada. America and Britain furnish tools and machines in exchange for the country's chief export—wool. Australians are progressive, anxious to improve their equipment. World War II made them realize the need of adequate manufacturing facilities.

Although wages are much lower than in Canada or the United States, purchasing power is higher. The traveler cited a housing project with units selling for the equivalent of $4000. "In Windsor," he estimated, "these homes would cost about $6000." Shortages of housing, materials and labor plague the Antipodes as they do the rest of the world.

Population is almost entirely of English extraction. Immigrants, largely from Great Britain, are boosting it at the rate of 70,000 per year and creating larger markets for manufactured goods.

From inspection of his company's and other industrial plants, Mr. Sampson is impressed with the initiative, resourcefulness and versatility of the Australian worker. "He takes work in his stride, but doesn't let it get in his way when there's an exciting sports event." If a big race is scheduled, everything closes for the day.

This national devotion to sports has produced a hardy, athletic stock. There is no severe weather, so they spend much time in the open.

With 2500 more square miles than the land area of continental United States, Australia has a variety of climatic conditions. In February when Americans go south to escape icy blasts, Australians do the same thing—to get relief from the heat. Seasons are reversed, so are weather zones. It's tropical in the north, temperate in the south.

Much of the country is unusable, but Mr. Sampson described the sections visited as "very lovely." Perth, on the west coast, he compared to Southern California. He was charmed, too, with the friendliness and hospitality of the people.

Tanned from his 25,000 mile air trip to this pleasant upside down land of summer, the Canadian ASTE'er still feels content with his own country.

Cecil G. Sampson, former chairman of Windsor chapter, alights from his clipper at Auckland, New Zealand, on recent business trip to inspect industry "down under"

Discusses Steel Pricing

Los Angeles, Calif.—Effect of the recent discontinuation of the basing point system on the West Coast steel supply was brought to the attention of Los Angeles members by Kenneth L. Vore, manager, transportation dept., Los Angeles Chamber of Commerce.

Mr. Vore gave an illuminating talk on this subject at the December 9 meeting of the chapter.

Another prominent guest was Santa Claus, who distributed gifts ranging from practical products manufactured by members' firms to mirth-provoking items.

In the absence of Leslie Hawes, chapter chairman, Gerald Stronks, newly-elected first vice-chairman, presided.

Research Physicist Looks At Metal Cutting

Milwaukee, Wis.—December meeting of Milwaukee chapter was held on the 9th at the Elks Club and featured two speakers.

Dr. M. E. Merchant, senior research physicist for the Cincinnati Milling Machine Co., gave a slide illustrated talk, "Physics of Metal Cutting."

Earlier Eldon Wolff presented a film entitled "The Kentucky Rifle." Mr. Wolff explained in detail how he succeeded in making this motion picture. The rifle portrayed is made by an old man in the Kentucky hills, using crude tools.

Chairman Joseph Ebner welcomed an attendance of more than 100. Program Chairman Arthur Gudert introduced the speakers.

Canadian Radio Reports Electronic Drive Talk

St. Catharines, Ont.—Demands of industry for adjustable speed drives at constant horsepower forced electrical manufacturers to develop and produce electronic drives.

So R. C. Cunningham of Canadian Westinghouse Co., Ltd., Hamilton, told Niagara District chapter in an address, January 6, before a meeting at Stamford Centre, Niagara Falls, Ont. Later in the evening Mr. Cunningham's talk was reported in a broadcast over the local radio station, CHVC.

Gives Constant Cutting Speed

Describing benefits obtainable from a wide range of machinery when fitted with electronic adjustable speed drives, Mr. Cunningham stressed particularly such machine tools as lathes and grinding machines. In dealing with a facing cut on a lathe, he showed that, as the facing tool approaches the center of the workpiece, the electronically controlled rpm. of the machine is slowly increased giving a constant cutting speed in fpm.

Thus greater tool efficiency is attained together with reduction in manufacturing time. With a grinding machine, the rpm. is increased as the wheel wears, resulting in a constant peripheral wheel speed. By this means the grinding wheel reaches optimum life and efficiency and it always can be run at correct speed.

The speaker continued with details of advantages of electronic drives on interconnected machines and power driven conveyors, when precise synchronization of several motors is required.

At the conclusion of his lecture, Mr. Cunningham answered questions from the floor concerning electronic applications in specific instances peculiar to local industries.

A social hour followed with refreshments and impromptu entertainment. Tool engineers were present from Hamilton, St. Catharines and Welland, as well as from the twin cities of Niagara Falls.

Shows Plastics for Home

Richmond, Ind.—Richmond members entertained their ladies at a dinner meeting, December 14, in the Richmond-Leland Hotel.

Feature of the evening was an address, "Plastics in Our World Today," by William J. Connelly, manager of Consumer Relations Division, Bakelite Corp. Mr. Connelly pointed out the wide range of plastics applications, then demonstrated several of particular interest to the women guests.

Conn, Chief Engineer

Chicago, Ill.—Harry Conn of Chicago chapter, ASTE, has been appointed chief engineer of Scully-Jones & Co., according to a recent announcement.

For many years Mr. Conn was associated with International Harvester Co. In 1942 he set up and directed the La Salle Engineering Co. in New York. He was also chief engineer for Gridley Farm Tool Co., Inc.

Decentralization Demands High Precision Control

Madison, Wis.—Development of precision control, from Eli Whitney's first conception of interchangeable parts, was ably presented to Madison members by John A. Harrington, chief engineer of the DoAll Co., Des Plaines, Ill.

Speaking at the chapter's January 4 meeting, Mr. Harrington compared production methods for the two world wars. During the 1914-18 conflict, production of a part was usually confined to one plant. But in the second global war absolute standardization through optical and mechanical means was necessary so that parts made to prescribed limits of accuracy in one plant would fit those made in another, at the assembly point.

Defines Standard Inch Reading

A standard inch, the speaker explained, is measured in the number of half-bands of cadmium red which can be read to an accuracy of four micro-inches.

Blueprints, Mr. Harrington cautioned, should be checked to determine whether limits are placed with proper consideration for final parts assembly. In general, he stated, it is necessary to have about one-tenth of the limit for the gage as compared to the limit of the dimension being checked. If a gage is designed to check a hole with a limit of .005 to -.005 in., accuracy of the gage should be approximately .0005 in.

In high production, he added, the theory of probabilities is often used to allow the balance between frequency of inspection and cost of rejects. Where sampling devices are designed to make periodic inspections, this factor must be carefully analyzed to make certain that the most economical basis is finally established.

A film, shown prior to the session, demonstrated a variety of sawing machines in operation. Data were also given on the use of hot saws on hard materials. These saws attain cutting speeds up to 15,000 fpm.

Wade Establishes Firm

Cleveland, Ohio—Earle E. Wade, former chief engineer for the Eberhard Manufacturing Co., and recently engaged in the used machinery business, has announced the formation of his own company, located in the Ferguson Bldg., at 1785 E. 11th St., Cleveland, 14, Ohio.

Mr. Wade will concentrate on buying and selling all types of used machinery and industrial equipment. He is a member of Cleveland chapter, ASTE.

Cloutier Named to CSA

Montreal, Que.—J. P. Cloutier, Montreal chapter standards committeeman, has been appointed to the Fits and Limits Committee of the Canadian Standards Association.

Mr. Cloutier is production superintendent, Engineering Products of Canada, Ltd. He is a former vice-president of the Societe d'Etudes Techniques, Sorel, and a member of ASME.

Alaska Rich in Oil, Coal Says Arctic Adventurer

Rockford, Ill.—Alaska has enough oil to supply the entire United States for 400 years at the present rate of consumption. It contains more coal than the state of Pennsylvania. There are no taxes (and none of the benefits) since it is not a state; and a million dollar lobby is beleaguering Washington to prevent Alaska from attaining statehood.

These and other arresting facts about this once remote territory were brought to Rockford chapter members by Clyde C. (Slim) Williams, international trail blazer, wolf-dog musher, miner, mail carrier and adventurer.

In a travelogue given before the chapter's annual ladies night dinner dance at Hotel Faust, Mr. Williams drew from his 32 years' acquaintance with the Alaskan country. Highlight of the lecture was his film, recording a 10,000 mile motor trip with his wife and two boys, from Chicago to the Arctic circle and back, over the Alcan Highway. Human interest experiences were documented, as well as the rugged beauty of the country and customs of the people.

In 1932-33 Slim Williams, the dominant character in Jack London's "Burning Daylight," drove a dog team from Copper Center, Alaska, to Washington, D. C., to plead with President Roosevelt and members of Congress for an Alaskan-Canadian international highway. Seven years later he repeated the journey by motorcycle.

Door prizes included a wrist watch awarded to Mrs. Henry Anderson and a bottle of perfume presented to Mrs. Howard Nelson.

Christmas Dance Parties

Bridgeport, Conn.—Annual Christmas party of Fairfield County chapter replaced the usual technical session, December 3.

Dinner and dancing at the Candlelight Restaurant were enjoyed by a large group of members and their guests. Professional entertainment rounded out the program.

* * *

Dayton, Ohio—Dancing to Bob Fields' orchestra featured Dayton chapter's annual Christmas party, held December 10 at the Miami Hotel. After midnight a buffet lunch was served.

* * *

Pittsburgh, Pa.—Pittsburgh chapter held its fourth annual Ladies Night Christmas party at the Roosevelt Hotel, December 16, 60 couples attending.

Following dinner Chairman Walter S. Risser welcomed the group and introduced chapter officers and their wives. Door prizes were presented to holders of lucky numbers, after which dancing was enjoyed to the music of Jack Walton's orchestra.

Each lady received a gardenia with the compliments of the chapter.

* * *

Worcester, Mass.—Eighty couples enjoyed an evening of entertainment and dancing at Worcester chapter's Ladies Night and Christmas party, December 7, at Putnam & Thurston's Restaurant. Gifts were presented to the ladies. Carl Schofield and Bernard Szarek headed the Entertainment Committee.

Among those present were Third Vice-President and Mrs. V. H. Ericson and National Membership Committeeman and Mrs. C. J. Lindegren.

Speakers' table guests at Worcester chapter's ladies night Christmas party included from left: Mrs. P. M. Sampatacus, Public Relations Chairman Sampatacus; Mrs. C. L. Morse, Second Vice-Chairman Morse; Mrs. C. D. Schofield, First Vice-Chairman Schofield, Miss Madeline Schofield; R. E. Rawling, chairman of the chapter, and Mrs. Rawling

Pontiac to Make Awards for Best Student Theses

Pontiac, Mich.—Awards will be presented to winners of Pontiac chapter's thesis contest, at the March Installation Night meeting. Competing for honors are students of General Motors Corp. Truck and Coach Training School, Pontiac Motors Training School and Pontiac High School Vocational Dept. Authors of the prize-winning papers will receive a year's membership in the chapter and a season dinner ticket.

The contest is part of an educational program directed by Stuart L. Nisbett, education chairman, and his committee, Owen Kline and Edward Markham.

Since June the committee has sponsored a series of monthly student technical sessions and plant tours. Programs scheduled for the remainder of the season are: February, "Tooling for Low Production or Job Shop Production," and plant tour of American Forge & Socket Co. or Baldwin Rubber Co.

March, "Tooling for Continuous High Production"; April, "Gaging Practice and Dimensional Control"; May, film lecture, "Use and Care of Indicator Gages," and plant tour of Great Lakes Steel Co.; and June, "Problems in Trouble Shooting."

Efforts of the chapter to acquaint vocational students with various phases of tool engineering have had enthusiastic support both from the boys and their instructors, attendance averaging 65.

Pittsburgh chapter officers and their wives participating in ASTE Christmas party are from left, standing: W. J. Bickmore, treasurer; F. T. Boyd, first vice-chairman; Mrs. Boyd; Mrs. H. L. Harper, Secretary Harper; and P. H. Magnus, immediate past chairman; seated: Mrs. Bickmore, Mrs. W. S. Risser, Chairman Risser, and Mrs. Magnus

Ladies See 'Professor's' Laborsaving Inventions

St. Charles, Ill.—Nearly 150 members and guests of Fox River Valley chapter enjoyed an entertaining Ladies Night program, presented December 7 at the Sky Club of the Leland Hotel in Aurora.

Highlight was a "lecture" by "Professor" Russell E. Oakes, better known as the "Wacky Wizard of Waukesha," on "Progress in Science and Invention." This inventive genius brought along a number of his gadgets, many designed and guaranteed to make life easier for the fair sex.

Since everyone is concerned with consuming food, Professor Oakes has devoted much of his effort to developing efficient aids to this ancient art. He demonstrated an attachment to make soup drinking splash-proof and completely noiseless; a corn holder which butters and salts a piping-hot ear without dripping and without burning the fingers; and a drip-proof doughnut dunker.

Dreams Up Aid for Movie Goers

To eliminate the annoyance of the cinema fan seated in front of patrons more interested in the latest gossip and a bag of peanuts, Professor Oakes has invented a special headset that brings in screen voices while completely muffling sounds from behind.

Climaxing his demonstration was a hydraulic cigarette lighter. A glass of water, poured into a funnel at the top, activates eight or 10 levers which eventually produce a flaming stick.

Following the lecture, the Sky Club floor show was presented, after which the guests danced to the music of Charlie Miller and his Hawaiians, who played also during the dinner hour.

Each lady received a Christmas corsage. Door prizes were awarded to holders of tickets bearing lucky numbers.

The chapter's good wishes were extended to Gilbert Jarman, membership chairman, who is being transferred to St. Louis, Mo.

Charles T. Everett, program chairman, handled arrangements for the social function.

Situations Wanted

MECHANICAL ENGINEER — 14 years' experience in all kinds of metal fabrication and mass assembly. Responsibilities have included production control, plant engineering, positions of master mechanic, chief inspector, and factory superintendent. Now employed. Holds B.S.M.E. degree; age 38; married; two children. Complete resume on request. Box 158, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

PLANT AND METHODS ENGINEER—Supervision of tool design, production methods; arc and resistance welding steel tanks, drums; galvanizing procedure; plant buildings and machinery maintenance. Fifteen years with present firm. Canadian, married. Available now. Please address Box 159, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

PRODUCTION OR MANUFACTURING ENGINEER—Desires permanent position with progressive company using machine tools. Practical engineer, age 49, married, 28 years' broad shop and tooling background, quality control, methods, tool supervision, production engineering, tool inspection, and machine and tool repair. Keen knowledge of single purpose tooling for mass production. Complete resume on request. Salary open. Address replies to Box 156, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

SALES ENGINEER—District representative for special machines and tools for Michigan industry. Has had wide experience in grinding and honing; well acquainted in auto industry. Fifteen years' experience; can furnish excellent references. Please write to Box 160, American Society of Tool Engineers, 10700 Puritan Ave., Detroit 21, Mich.

Announcements of Coming Meetings should reach *The Tool Engineer* two months before date of meeting.

G.E. Technical Men Talk On Silicones, Plastics

Montreal, Que.—Canadian General Electric Co. sponsored the technical program presented at a meeting of Montreal chapter, December 10, in the Canadian Legion Memorial Hall.

F. D. Cobbett, manager of chemical section, Montreal, outlined the uses and future possibilities of silicones, and T. J. Carey, manager of plastics section, Toronto, explained molds and tools used to produce plastic parts.

There is great commercial interest in silicone compounds, said Mr. Cobbett. Resistance to water and high temperature has led to their use in water-repellent textiles, varnishes, waxes and polishes.

Medical science has found they possess properties which prevent clotting of blood, and foaming in pharmaceutical preparations. Silicone rubber is used for gaskets on anti-aircraft searchlight lenses and in jet engines.

Interesting demonstrations included "bouncing putty," a one-time useless product now finding wide acceptance for golf ball centers, due to its great resiliency.

Groups Plastics by Types

In his talk Mr. Carey classified plastics into two groups: one, comprising phenolics, melamines and ureas, are thermosetting materials pressed at two tons psi. in a heated mold. During this process a chemical change occurs preventing their being reconverted to their original state.

The second group is made up of thermo-plastics such as cellulose acetates, butyrates and polystyrene, molded by extrusion and injection processes. They can be molded six times as fast as the thermosetting plastics and the scrap can be melted and reused.

Mr. Carey recommended the high-speed plunger type mold because it saves scrap and cuts time by employing the generated friction to help cure the material. The plastic is used in a pellet form, partly cured before molding.

With slides Mr. Carey showed everyday uses for plastics, such as in building blocks for interior walls, flooring, upholstery and wall coverings, garden hose, piano keys and boats.

Michael Baker introduced the speakers and Marc Cote thanked them on behalf of the chapter. W. W. Schug, vice-president and general manager of sales of the V & O Press Co., Hudson, N.Y., was a guest. Attendance included 67 members and visitors.

Joins New Era Industries

Cedar Rapids, Iowa—John M. Speck, a former machine design engineer for Cherry-Burrell Co., is now associated with New Era Industries as tool engineer in charge of design and manufacture of special machinery.

Mr. Speck was instrumental in the organization of Cedar Rapids chapter and served as its first chairman. He now heads the membership committee.

Mid-Hudson Presents Screw Machine Program

Poughkeepsie, N. Y.—A. R. Sparrow, in charge of sales engineering at Brown & Sharpe Manufacturing Co., addressed approximately 75 members and guests of Mid-Hudson chapter, December 14, at the Nelson House.

Speaking on "Automatic Screw Machines and Tooling Applications," Mr. Sparrow explained capacities, speeds and features of single-spindle automatics. With lantern slides, he illustrated an automatic screw threading machine used primarily for threaded parts, and a pinion turning machine recommended for parts requiring high finish and close tolerance.

Accessories mentioned included a skiving tool. Removing not over .002 in. of stock, this tool was said to produce work tolerances of .0003 in. with very little maintenance.

Ellis Thorpe, education chairman, presented certificates to those completing the course on Brown & Sharpe automatic screw machines, first of a series of eight-session courses on tool design subjects sponsored by the chapter. Instructor for the course was Ralph Now, a member.

Students receiving certificates are: Frederick Burley, Ivor F. Dingee, Stephen Mead, John Schaeffer, Walter Thomson, Kenneth Trahn, Leonard Travis and Richard Ziegler. A seminar on blanking dies is now in progress.

Aircraft Executive Sees Steady Gains for Industry

San Diego, Calif.—If the aircraft industry would build solidly on a smaller volume of units per year, instead of looking for the elusive 35,000 annual plane market theoretically created by the war, it would have a prosperous future in private aircraft manufacture.

This opinion was expressed by Earl D. Prudden, Ryan Aeronautical Co. vice-president, in reviewing "Progress of Aviation in San Diego" at a dinner meeting of San Diego chapter, December 9.

Mr. Prudden told of the establishment of an aviation school and building of the first Ryan ST's by T. C. Ryan in the '20's, and the construction of the plane for Lindberg's famous solo flight from New York to Paris.

A one-time Ryan student and welder, who busied himself installing extra gas tanks in the cockpit of his plane, later made the headlines as "Wrong Way Corrigan."

Mr. Prudden recalled the first contracts with the U. S. Government, to train cadet pilots for the preparedness program. Following our entrance into the war, the training schedule was accelerated, and transferred to Arizona for security reasons.

Then came the buying and transferring of tools and machinery for manufacturing the Navion, which Ryan Co. purchased from North American Aviation, Inc., entailing the moving of some 300 truck loads of equipment from Los Angeles to San Diego.

A membership attendance of 80 heard Mr. Prudden's address.

William A. Alexander, past chairman of Hamilton chapter, asks Dr. Martin Johns, physics professor at McMaster University, about prospects of atomic power for industry. Dr. Johns described and demonstrated nuclear energy before chapter. From left: William A. Dawson, national chairman, Committee on Professional Engineering; Mr. Alexander; Dr. Johns, Gordon Hall, chapter chairman; and Harry H. Whitehall, another former chairman of the Ontario group.

Light Waves Offer Tool For Precise Measuring

St. Catharines, Ont.—"Tool engineers must be prepared to meet closer and finer specifications of size and finish" was the theme of Adam Gabriel of Acme Industrial Co. in a talk, "Light Waves and Their Uses in Precision Shop Measurement," given before a meeting of Niagara District chapter at the Queensway Hotel, December 2.

Mr. Gabriel, who recently served on a committee advising the United States Bureau of Standards on surface finish nomenclature and measurement, outlined the historical background of measurement specification and described the method adopted by the Bureau.

With slides he illustrated the tracer recorder type of instrument used in the United States and in Great Britain. He explained the method of moving a needle tracer along the surface of the material to be measured, transferring the movement of the needle into electrical voltages, amplifying and recording it as a micro-inch measurement.

Existing micro-inch values were compared, including the R.M.S. value adopted by the U. S. Bureau of Standards. Use of optometers for measuring size and optical comparators for checking surface finish also were discussed.

Minutely Mr. Gabriel described how monochromatic light of known wave length passes through an optical flat placed on the surface of the piece to be checked. If error occurs the light waves reflected from the piece will be alternately in and out of phase with those reflected from the flat. Those out of phase will interfere with each other and cause dark lines or rings.

By counting the number of bands and knowing the type of light source, an error may be calculated. Using this method it is possible to determine whether an object is convex or concave and, with precision flats, if it is tapered or parallel, undersize or oversize.

Lang with Tool Service

Detroit, Mich.—Larry W. Lang of Detroit chapter has been appointed sales manager of Tool Service Co., a cutter reworking firm.

Well known in industry and in the Society, Mr. Lang has addressed chapter and national meetings of ASTE.

Higher Living Standards Demand Better Tooling

Erie, Pa.—Higher standards of living require better tooling and manufacturing to balance supply and demand of materials and technically skilled men.

H. W. Gouldthorpe, manager of engineering, Locomotive and Car Equipment Division, Erie Works, General Electric Co., emphasized this in a talk on "Engineering Tools" before Erie chapter December 7.

These tools, he said, should be considered by the product design engineer, to facilitate tooling and production.

During the recent war, technically skilled men were absorbed by the armed forces. Trained in the service and in college, these men are now being utilized in all kinds of manufacturing, the speaker continued.

Impressing upon his listeners the desirability of protection by professional engineering licensing, Mr. Gouldthorpe urged them to investigate the possibilities of becoming registered professional engineers.

Following the lecture Lt. John Schumacher of the U. S. Navy showed a thrilling film of wartime naval action in the Pacific.

Forty members and guests attended the dinner meeting at the Sportsman Tavern.

Professor Demonstrates Atomic Energy

Hamilton, Ont.—Dr. Martin Johns, assistant professor of physics at McMaster University, described atomic development and possibilities to 75 members and guests attending a recent meeting of Hamilton chapter.

Elementary principles of nuclear energy were first explained. Demonstrations with radio-active materials, a chalk talk on the atom, and a film, "Operation Crossroads," illustrated his lecture.

The motion picture showed the atomic bomb experiment at Bikini in Technicolor. A lively question period followed Dr. Johns' address.

W. A. Dawson, a former chapter chairman, introduced Dr. Johns, and Harold Millett expressed the chapter's appreciation for his talk.

During the meeting J. N. Walton, another former chairman, presented a past chairman pin to Harry Whitehall.

Coming MEETINGS

ALL CHAPTERS—February. Election of chapter officers and delegates. March. Installation of officers.

CENTRAL PENNSYLVANIA—February 17. Speaker: Anthony Zamis, Illinois Tool Works. Subject: "Design of Gear Teeth." March 17. Speaker: R. R. Rhidehamel, National Acme Co., Cleveland, Ohio. Subject: "Tooling Multiple Spindle Automatics and How."

CLEVELAND—February 11. Old Timers' Night, honoring J. R. Fitzsimmons. March 11. Speaker: J. I. Karash, process eng., Reliance Electric & Eng'g Co. Subject: "Design of Dies for Inclinable Punch Presses."

DAYTON—February 14, 6:30 p.m., Suttmiller's Restaurant. The American and National Leagues of Professional Base Ball Clubs in cooperation with A. G. Spalding & Bros. Co., present "World Series of 1948." Guest speaker and film.

DETROIT—February 10. Engineering Society of Detroit banquet hall. President's Night. Speaker: I. F. Holland, ASTE pres., and gen. supt., small tool and gage dept., Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford, Conn.

ELMIRA—March 7, 7:00 p.m., Mark Twain Hotel. Speaker: Malcolm F. Judkins, chief engineer, Firth-Sterling Steel & Carbide Corp., McKeesport, Pa. Subject: "Sintered Carbides."

NEW HAVEN—February 10, 6:10 p.m., dinner at Fitzgeralds; 8:00 p.m., meeting, Dunham Laboratory, Yale University. Speakers: Messrs. Doyen and Kessler, Welding Equipment & Supply Co. Subject: "Tool and Die Welding." March 10, same time and place. Speaker: T. J. Donovan, pres., Donovan Heat Treating Co., Philadelphia, Pa. Subject: Quiz Program on Heat Treating.

NEW YORK, GREATER—March 7. Speaker: Gunnar Palmgren, chief engineer, SKF Industries, Inc. Subject: "Application and Selection of Proper Bearings in the Design of Machine Tools."

NIAGARA DISTRICT—March 3, 7:00 p.m., Welland, Ont. Speaker: P. E. Cavanagh, Ontario Research Foundation. Subject: "Cathode Ray Equipment for Non-Destructive Testing of Metals."

PEORIA—March 3, 6:30 p.m., Jefferson Hotel. Speaker: Eric O. Johnson, vice-pres. and gen. mgr., American Div., Avco Mfg. Corp.

PHILADELPHIA—February 17. Subject: "Optical Comparators and Their Application." Speaker from Jones & Lamson Machine Co. March 17. Subject: Broaching Symposium.

PITTSBURGH—March 10-12, William Penn Hotel, ASTE 17th Annual Meeting. March 11, House of Delegates Meeting and Board of Directors Meeting. March 12, Annual Dinner and National Membership Meeting.

RACINE—March 7, 6:30 p.m., Dania Hall. Stage presentation: "General Motors Previews of Progress."

TORONTO—March 2. Subject: "Modern Trends in Machine Tool Design," presented by Modern Tool Works, Ltd.

TRI-CITIES—March 2. Guest Night. Speaker: A. E. Rylander, technical editor, *The Tool Engineer*.

TWIN STATES—March 9, Springfield, Vt.

WINDSOR—February 14. Speaker: Dr. M. E. Merchant, Cincinnati Milling Machine Co. Subject: "Metal Cutting." March 14. Speaker: K. F. Tupper, director of eng'g, Chalk River Project.

Warren L. Hardy (left) of Norton Co. is congratulated by H. O. Simons, Rochester chapter chairman, after his lecture describing grinding of hardened tool steels

Schnitzer in New Post

Pawtucket, R. I.—Ernst Schnitzer of Little Rhody chapter has joined the H. & B. American Machine Co. of Pawtucket, as development engineer.

'Guard Against Cracks,' Warns Grinding Expert

Rochester, N.Y.—Warren L. Hardy, abrasive engineer for the Norton Co., Worcester, Mass., addressed Rochester chapter at a meeting held December 6 in Rochester Institute of Technology. Mr. Hardy's subject was "Important Factors in the Grinding of Hardened Tool Steels."

In discussing defects and causes affecting the grinding condition of steel, he warned against cracks. These flaws are difficult to see and tend to spread. Surface stresses are minor, he stated, compared to cracks.

Nitric Acid Shows Up Cracks

While cracks and stresses are not always visible, it is now possible to determine whether they exist before grinding, by depth, pattern and nature of crack. An easy method of discovering cracks is by etching with nitric acid, he pointed out.

Excessive hardness or softness of steel, the speaker cautioned, should be checked before grinding. Other essential factors are: correct wheel, wheel speed, work speed, and correct dressing of wheel for stock to be ground.

Effect of a grinding burn, its detection, and solutions to problems discussed also were included in the presentation. Mr. Hardy's talk was highlighted throughout by lantern slides illustrating the subject matter.

After his lecture the speaker conducted a lengthly question and answer period.

H. O. Simon, chairman, presided and announced that M. L. Roessel, Joseph Schick, Chauncey Newton and Charles Seely would constitute the chapter Nominating Committee. Mr. Roessel is chairman of the committee.

Mr. Simon also reported comprehensively on the Los Angeles convention to the 110 members and guests present.

Obituaries—

Horace R. Wentzell

Victim of a sudden heart attack, Horace R. Wentzell, 62, vice-president and works manager for Adams Engineering Tool & Die Co., South Bend, Ind., passed away at his home in that city, December 5.

He was born in Camden, N.J., and trained as a draftsman at Spring Garden Institute, Philadelphia. In 1910 he joined the Ford Motor Co. at Detroit and was subsequently employed by several automobile manufacturers.

Twenty-six years later he left the Studebaker Corp. in South Bend, as chief tool designer and superintendent of tools, to become a partner in the Adams firm.

A charter member of South Bend chapter, ASTE, he had been chapter chairman, national director, area vice-chairman of the National Standards Committee, and had served on the National Membership and National Constitution and By-Laws Committees.

* * *

Fred W. Gollbach

Fred W. Gollbach, 59, president, Ace Tool & Die Co., Detroit, Mich., died December 30 from a cerebral hemorrhage. Although he had been in ill health for 10 years, his death was unexpected.

A native of Germany, Mr. Gollbach was a mechanical engineering graduate of a government technical school at Wanne. Prior to coming to the United States in 1914, he worked as an electrical engineer.

After service with several metal working firms in the East and Midwest, he joined Ace Tool & Die Co. as assistant vice-president. He became a naturalized United States citizen while in Detroit.

Since 1932 he had been a member of Detroit chapter, ASTE. He was affiliated also with several fraternal orders.

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Air and Hydraulic Cylinders

Two recent catalogs are offered, No. A-48 on Hydro-Line air cylinders, and No. H-48-LP on hydraulic cylinders. No. A-48 covers construction features and specifications for air cylinders in various mountings, with both single and double end rods. No. H-48-LP covers similar points on hydraulic units. *Hydro-Line Mfg. Co.*, 711 Nineteenth St., Rockford, Ill.

Bending Machine, Hydraulic

An eight page bulletin announces the addition of a portable hydraulic ram-type bending machine to the line of Wallace benders. Features include easier bending and facility for quick setting for duplication. *Wallace Supplies Mfg. Co.*, 1308 West Diversey Parkway, Chicago 14.

Broaches, Keyway

Condensed four page folder presents complete line of keyway broaches and kits for hand cutting of keyways in gears, cutters, couplings, collars, propellers, etc. *The du Mont Corp.*, Greenfield, Mass.

Cylinders

Twelve page catalog describes line of air and hydraulic cylinders, designed for the machine tool industry. Features include tie-rodless construction; all steel body parts; bearing bronze on wearing surfaces; and a number of others. *Ortman-Miller Machine Co., Inc.*, Hammond, Ind.

Dies, Marking

Four page catalog describes the importance of product identification, and types of dies available in the form of mold inserts, roll dies, steel hobs, punch press and insert stamps for marking various products. *The Metal Marker Mfg. Co.*, 1384 East 40th St., Cleveland.

Forging Data

A comprehensive 44 page booklet covering general reference data on forgings describes the types and characteristics of forgings, characteristics of forging metals, including alloy steels. The forging process, heat treating procedure, machining and inspection are included. *The Steel Improvement and Forge Co.*, 969 East 64th St., Cleveland.

Gas Flow Meter

The type GF gas flow meter unit is described in a two-page folder recently released. Claimed to remove the "human element" from flame balancing in metallizing, they aid in more uniform application of coatings. *Metallizing Engineering Co., Inc.*, 38-14 30th St., Long Island City 1, N.Y.

Gear Head

Four page circular illustrates and describes two speed gear head which may be attached to any portable milling head for increasing available number of speeds. *Olson Industrial Products, Inc.*, 40 W. Water St., Wakefield 59, Mass.

Hose, Metal

Four page bulletin describes line of flexible metal coolant hose. Designed especially for conducting coolants on machine tools, hose combines adjustability with rigid maintenance of position. *Chicago Metal Hose Corp.*, Maywood, Ill.

Induction Heating

Illustrated booklet, 48 pages, covers general principles of induction heating, with additional sections devoted to hardening, forging, brazing and annealing. *The Ohio Crankshaft Co.*, Dept. D-19, Cleveland 1.

Jig Borer

Catalog No. 948, 12 pages, describes a recently-developed jig borer announced by SIP and known as the Hydroptic 8. Specifications for this and other sizes are given. *Cosa Corp.*, 405 Lexington Ave., New York 17.

Lubrication, Industrial

Recent rotogravure catalog, 48 pages, describes industrial lubrication equipment available for industry. Features novel selection guide. *Stewart-Warner Corp.*, 1826 Diversey Parkway, Chicago 14.

Plug Valves, Lubricated

Catalog 48-V, 16 pages, covers complete line of lubricated plug valves. In addition to drawings, tables and descriptive matter, the catalog contains a full-page cross section of the valve. *H. K. Porter Co., Inc.*, 7001 W. 66th Place, Chicago 38.

Power Unit

Universal power unit is described in four page folder, No. R-101. Can be used to turn or position for welding, grinding, sand-blasting, etc., at surface speeds of from 3 to 26 ipm. *Kinmont Manufacturing Co., Inc.*, 716 W. Wilson Ave., Glendale 3, Calif.

Presses, Open-back

Ten page catalog describes and illustrates Diamond open-back inclinable presses for industry. Specifications and construction features are given for presses ranging from nine to 56 tons. *Diamond Machine Tool Co.*, Los Angeles, Calif.

Recorders - Controllers

Recorders and controllers for measurement of pH and conductivity are described in Catalog 15-12, 44 pages. Fundamentals of pH and conductivity are well covered, with extensive data on theory and application. *The Brown Instrument Co.*, Wayne & Roberts Aves., Philadelphia 44.

Retaining Rings

Catalog 4K-6, on standard types of retaining rings, provides 28 pages of data on ring dimensions, thrust load capacities, materials, tensile strengths and types of finishes. *Truarc Division, Waldes Kohinoor*, Long Island City 1, N.Y.

Rotary Files

Six page folder and price list on rotary files, both hand cut and ground from the solid, gives specifiactions and prices of complete line. *American Swiss File & Tool Co.*, Elizabeth 1, N. J.

Speed Reducer

"More Horsepower per Dollar" is the title of a catalog describing the line of Speedaire fan-cooled worm-gear speed reducers. The 8-page bulletin features reprints of typical applications. *The Cleveland Worm & Gear Co.*, 3249 East 80th St., Cleveland 4.

Steel, Free Machining

Four page bulletin available which describes a free machining steel, Rycut. Having a hardness equivalent to that of AISI 4150, the alloy is claimed to effect savings of 25 to 50 percent in machining time. *Joseph T. Ryerson & Son, Inc.*, Box 8000-A, Chicago 80.

Tapping and Threading Machine

Seven page bulletin describes the No. 11 Warner and Swasey tapping and threading machine, which is said to combine accuracy with volume on a production scale. *The Warner and Swasey Co.*, Cleveland 3.

Tools, Machinists'

Small tool catolog, 28 pages, lists line of micrometers, vernier calipers, height gages and other machinists' tools. A recently-acquired line is included, featuring various measuring tools. *George Scherr Co.*, 200 Lafayette St., New York 12.

Turrets, Lathe

Catalog No. 48, 16 pages, describes the applications of turrets on actual jobs. Selection charts are included, showing manufacturers' recommendations. *Enco Mfg Co., 4522 Fullerton Ave., Chicago 39.*

North East West South IN INDUSTRY

Leo E. **Jacobs**, formerly executive vice president of Charles H. Besly & Co., Chicago, has been named president of **Titan Abrasives Co.**, also of Chicago. Charles H. Besley & Co. have been the exclusive distributor of Titan abrasives for the past twenty-five years.

A. A. **Bolik** has been appointed general sales manager of the **Thunder Bay Manufacturing Corp.**, according to Francis D. Tait, president. General offices of the press manufacturing company are in Detroit.

K. Y. **Taylor**, formerly vice president in charge of manufacturing, has been appointed executive vice president of **Charles H. Besly & Co.** Other promotions include **W. C. Olson**, formerly comptroller, to vice president; **Everett Addoms**, formerly sales promotion manager, to vice president; and **H. G. Haarz**, formerly assistant treasurer, to treasurer.

Alexander S. Keller, vice president and manager of export sales, **Pratt & Whitney** division of **Niles-Bement-Pond Co.**, has been appointed senior industry officer in the Netherlands Mission of the **Economic Cooperation Administration**, it has been announced.

Joseph T. Ryerson & Son, Inc., has announced construction of an addition to their Chicago plant which will provide approximately 118,000 square feet of plant and office space.

Ruel T. Caldwell, formerly secretary-treasurer, has been named president of **Holcroft & Co.**, Detroit, manufacturers of heat treating furnaces. **Charles T. Holcroft**, founder of the company and president since 1917, remains as secretary and consultant. **Walter H. Holcroft** was appointed executive vice president; **C. H. Martin**, vice president; **R. H. Cadwell**, treasurer; and **A. W. Criger**, assistant secretary.

General Electric Company has leased from the War Assets Administration the former Remington Rand plant in Johnson City, N. Y., for an expansion of facilities to manufacture special equipment for the Air Force.

John A. Sargent has been elected executive vice president of **Diamond Alkali Co.**, it was announced by Raymond F. Evans, president. Mr. Sargent, formerly vice president, finance, joined the company in 1946 as treasurer.

A number of promotions have been announced by **The Cincinnati Milling Machine Co.**, according to Walter W. Tangeman, vice president and general manager. **David M. Strauchen**, formerly general shop supt., was named manager of a new special products division. To replace him as general shop supt., **Alfred T. Blackburn** has been promoted from the production control division. **George W. Binns** heads new developments for the company; **John B. Elfring**, former head of the tool design section, was named manager of production control, time study, planning and tool design. **Harold Thomas** moves up from assistant to head of tool design, and **Fred Miller** was promoted from supervisor of plant 2 to assistant general superintendent.

David M. Strauchen **Alfred T. Blackburn**

George W. Binns **John B. Elfring**

J. L. Gilliam, formerly assistant director of procurement, has been named implement purchasing agent of **Harry Ferguson, Inc.**, Detroit.

The Tool Engineer Inadvertently omitted a credit line to **William H. Oldacre** in the "Selection of Metal Cutting Fluids" chart in our January issue. Mr. Oldacre, president of D. A. Stuart Oil Company, Chicago, is the author of this original material.

W. W. Kuyper has been appointed divisions engineer of the turbine, generator and gear engineering divisions of **General Electric's** Lynn, Mass., River Works, it has been announced recently. Mr. Kuyper will succeed **K. M. Holt**, who is retiring after more than 40 years of service. Also announced were the appointments of **E. N. Twogood** as division engineer of the gear engineering division, and of **J. J. Zrodowski** as designing engineer of the division.

John L. Cook, formerly president of Winter Brothers Co., a subsidiary of National Twist Drill and Tool Co., has been elected president of **National Machine Products Co.**, Detroit. Mr. Cook succeeds the late Clare L. Brackett, who had been president until his recent death.

Herbert E. Smith has been elected chairman of the board, and **Harry E. Humphreys, Jr.**, president and chairman of the executive committee of **United States Rubber Co.**, it has been announced. At the same time, **F. B. Davies, Jr.**, board chairman for 20 years, announced his retirement. Mr. Davies will remain as a director.

A. W. Pingel has been appointed industry manager of the industrial parts division, **Reynolds Metals Co.**, it was announced by Lee Stratton, manager of the parts division.

Robert M. Arnold has been elected to a new vice presidency of **Allegheny-Ludlum Steel Corp.** Mr. Arnold is also president of Arnold Engineering Co., Chicago, a wholly-owned subsidiary.

All-State Welding Alloys Co., Inc., New York, has announced completion of its new headquarters at 273 Ferris Ave., White Plains, N. Y.

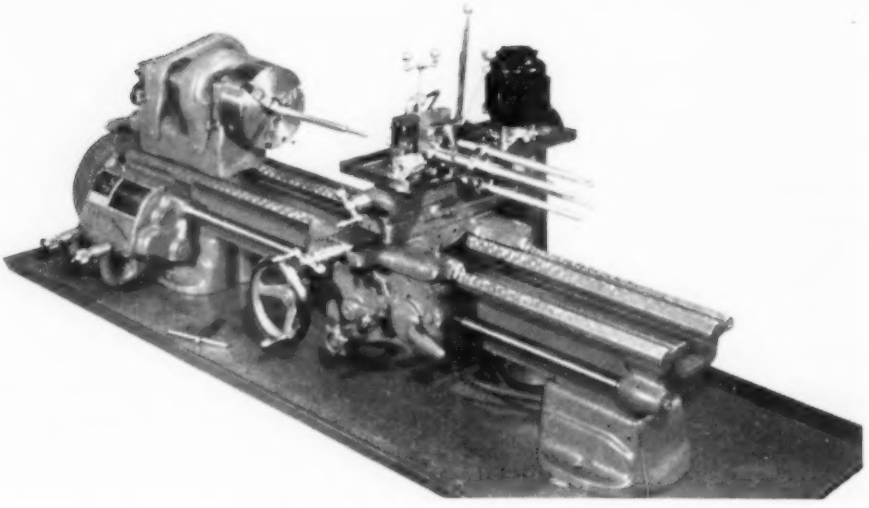
Joseph F. Lask has been appointed general manager, and **John L. Bradford** sales manager of the **Modern Collet & Machine Co.**, Ecorse, Mich. Mr. Lask has been with the automotive and tool industries since 1912, and recently came to Modern Collet & Machine from Gairing Tool Co., where he was factory manager.

Richard M. Somers has been named chief engineer of the **Ediphone division** of **Thomas A. Edison, Inc.**, it was announced by A. P. Horner, vice president.

Maurice Davier has been named general manager of the **Van Cleef division** of **Johns-Manville Corp.**, according to an announcement by R. W. Lea, president.

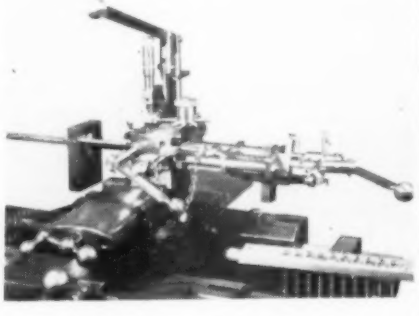
McMillan Robinson has been appointed sales manager of the metal products division of **Koppers Co., Inc.**, it has been announced by Walter F. Perkins, vice president and general manager of the division.

TOOLS OF TODAY



Attachment For Slender Turning

Practically any diameter and practically any length, or any combination of length and diameter, is said to be accurately turned on an attachment manufactured by Karge & Son Machine Co., Brockport, N. Y. Called the Turnomatic, the attachment is, to all practical purposes, a self-contained screw machine that can be mounted on the slide-rest of a 9 to 12 in. late. It can also be used with hand screw machines, milling machines or drill presses.



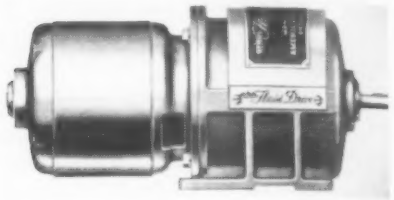
The attachment is available in two models, both of which incorporate the basic principle whereby the stock—centerless ground or commercial round—is machined close to guide bushings.

Model A is a precision tool said to be capable of producing work to tolerances plus or minus 0.0002 in. or less, with reasonable care. It is made in one size only, to take stock ranging from 3/32 to ¼ in. in diameter.

Model B is essentially a production tool available in three sizes, one with 0 to ½ in. capacity, one of ⅜ to 1 in. capacity, and the other ¾ to 1¼ in. The larger percentage of the long slender work required by industry falls within these ranges. **T-2-1**

See Page 80 for Handy Tools of Today Coupon

Hydro-Electric Power Units



A line of Hydraulic Electric Power Units, by American Blower Corp., Detroit 32, Mich., is designed to permit smooth acceleration from lowest starting current. The motor starts unloaded and comes up to 85% full speed before starting the load.

The units, which have built-in Gyrol Fluid Drive, are said to be particularly advantageous on conveyor lines where vibration causes parts to fall off. Also, the drive eliminates use of shear pins as the fluid cushions any shocks or overload. Currently available with 5 and 7½ HP motors. **T-2-3**

Precision Rod Cutting at High Speed

with the New

DI-ACRO ROD PARTER

"PARTS OFF" MANY MATERIALS

All hot and cold rolled rods
Stainless steel
Chrome Molybdenum
Aluminum Brass
Copper Bi-metals
Many types of plastics
Fibre Rubber
Wood

The DI-ACRO Rod Parter further increases the applications of "DIE-LESS DUPLICATING" as a cost-cutting, time-saving production technique so well established by DI-ACRO Precision Benders, Brakes and Shears.

Do you require precision?—The DI-ACRO Rod Parter holds tolerance to .001" on duplicated cuts. The ends are square, and roundness is maintained.

Do you want speed?—The Rod Parter exceeds output of other methods with equal accuracy, on rods and bars up to 5/8". Torrington Roller Bearings incorporated in an exclusive multiple leverage arrangement provide remarkable ease of operation in both heavy and light materials.

GET "DIE-LESS DUPLICATING" CATALOG

Shows parts produced without die expense by DI-ACRO Benders, Brakes, Shears, Rod Parters, Notchers, Punches. Send for your free copy.

Pronounced "DIE-ACK-RO"

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

375 EIGHTH AVENUE • LAKE CITY, MINNESOTA

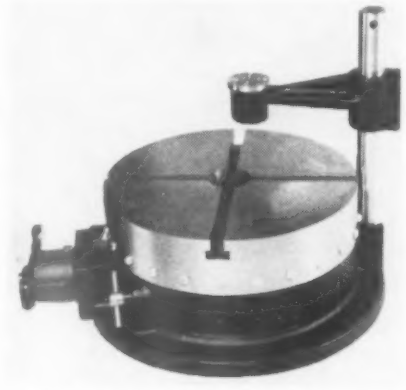
24 in. Radius Forming Brake

O'Neil-Irwin Mfg. Co., 375 Eighth Ave., Lake City, Minn., announces the 24 in. Di-Acro Radius Brake No. 4, "big brother" to the 12 in. tool previously developed by this company.

The 24 in. model has been primarily designed for the forming of duraluminum, chrome molybdenum and other materials of low ductility that would fracture if formed to a sharp or "no radius" bend. The radii obtainable with this unit are said to be in accordance with standards recommended by the U. S. Army Air Corps for different thicknesses of these metals.

In addition to these materials, the machine is also valuable for forming ductile metals where radius bends are desired because of product design, and, with its 24 in. capacity in 16 ga. sheet steel, is also suited for both production and experimental work. **T-2-4**

Attachment For Rotary Table



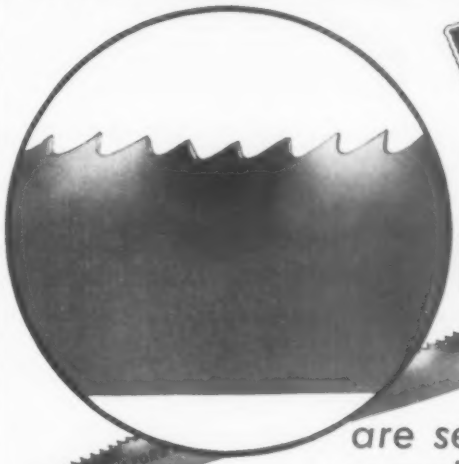
Added to the line of machine tool accessories by Troyke Mfg. Co., 4222 Appleton St., Cincinnati 9, Ohio, is a Drilling Attachment for use with the Troyke rotary tables.

The arm, which carries a removable drill bushing, can be swung to drill any radius from 1¼ in. to full capacity of the table, permits single hole drilling of parts which can be loaded and progressively drilled on an indexing table, or, such parts as wheels may have a series of radial holes drilled at the one setting. **T-2-5**

MILFORD

WAVY SET

BAND SAW BLADES



are setting new cutting records especially on horizontal band saw machines everywhere!

Users tell us . . . these Wavy Set blades are cutting better than 30% more metal . . . 50% more they say, on stainless steel . . . than any standard raker set blade. And cutting at closer tolerances!

Why? Just three major reasons tell the story . . .

Individually packed in cartons for easy handling.

FIRST . . . the teeth are set into the back of the saw, which means added strength . . . and practically no tooth rippage.

SECONDLY . . . the wave helps clear the chips from the cutting area . . . resulting in straighter cutting and material increase in blade life.

THIRD . . . made by saw specialists . . . the originators of the WAVY SET BLADE . . . who have incorporated new principles in basic design and heat treatment.

Order from your Mill Supply Distributor. He is always ready to serve your needs for all industrial supplies, including MILFORD hack saw and band saw blades.

You owe it to yourself to test a Wavy Set blade on your own machine . . . right away.

MILFORD

PROFILE AND BAND SAW BLADES
REZISTOR AND DUPLEX HACK SAW BLADES

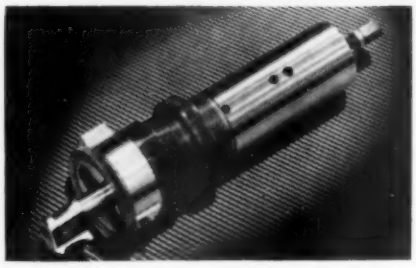
THE HENRY G. THOMPSON & SON CO.

Saw Specialists Exclusively for over 70 Years

NEW HAVEN 5, CONNECTICUT, U. S. A.

Recess-O-Matic Tools

The Maxwell Company, 250 Broadway, Bedford, Ohio, announces a line of Recess-O-Matic recessing tools designed especially for use on multiple-spindle automatics. These tools can be attached quickly and are actuated by a telescoping draw-bar which connects to back of machine.



Work set-up requires no cam change. Adjustment for locating recess is made in conjunction with feed cycle of cam, and adjustment for recess diameter is readily made on the tool itself by means of a micro-adjusting unit. Actuating mechanism of the tool reduces machine feed in a ratio of 2.75:1 to the recess cutter.

Up to the capacity of each holder, recessing work of various diameters is accomplished by positioning of cutter holding block in the tool, thereby making it possible to do work at extreme capacity of the tool without occasioning increase of cutter overhang. Cutters can be either high speed steel or carbide tipped. Models 1½-DB, 2-DB, and 3-DB have maximum capacities of 2, 3, and 4 in. respectively, with recessing stroke ranging from 9/32 in. on the smallest tool to ½ in. on the largest in line.

T-2-6

Rolling Threads up to 4" Diameter

on Heat-Treated Steels

with the NEW

REED RID

A32 Cylindrical Die THREAD ROLLER

This new Reed A32 Cylindrical Die Thread Roller with positive cam control of three cylindrical dies, produces uniform smooth precision threads on heat-treated steels at surprisingly high rates of production. Thread rolling is a cold-forging process that forms the thread by displacement of metal. This process increases fatigue strength and results in considerable saving of expensive materials.

Send us specifications of your requirements and let us supply you with complete information.

Reed Rolled Thread Die Co.

Devoted exclusively to thread and form rolling tools

Knurls – Thread Rolling Dies and Machines

Worcester 2, Massachusetts, U. S. A.

TE-211

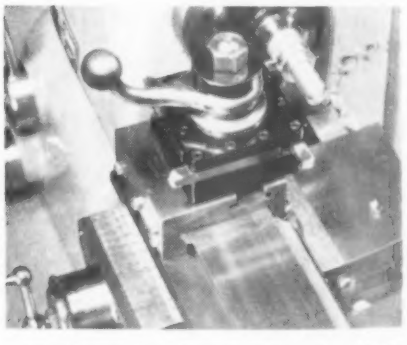
Contours Conveyor

A Continuous Conveyor, by Honan-Crane Corp., 676 Wabash Ave., Lebanon, Ind., is designed for continuous automatic transport of any material which can settle at the bottom of a tank, hopper, bin or other form of reservoir.

The conveyor consists of a series of neoprene or cast iron flights, assembled on an endless chain, which are pulled through a pipe casing by means of a high-torque transmission. The casing is custom-bent to specifications of origin and delivery point is of 2, 4 or 6 in. diameter, depending on the requirements of the particular installation.

T-2-7

Automatic Indexing Turret



Hardinge Brothers, Inc., Elmira, N. Y., announces an Automatic Indexing Square Turret for the compound slide of Hardinge precision lathes. This square turret, which can be applied directly to the tool post T-slot of the compound slide, takes four standard 5/16 in. square tool bits. Accurate indexing is accomplished through a hardened and precision ground tapered index pin which locates in mating hardened and precision ground stations.

The turret indexes rapidly by a simple movement of the ball handled lever. Moving the lever, the turret is automatically unlocked, indexed to the next tool position and then relocked, ready for the next machining operation. T-2-8

Precision Jig Borer

A Swiss precision Jig Boring Machine, said to combine highest accuracy with exceptional output capacity, is made available by Hauser Machine Tool Corp., Manhasset, N. Y., exclusive U. S. factory representative of Henri Hauser, Ltd., Bienne, Switzerland.

A feature of this machine—the Hauser 2BA—is the completely centralized control. From the operating position, in front of the machine, all controls are within convenient reach to provide easy and efficient handling. Micrometer screws are made of special steel, hardened, and high precision-ground. The microscope, manufactured according to the Hauser patented method of 3-point suspension, is quite independent of the rotating part of the spindle.

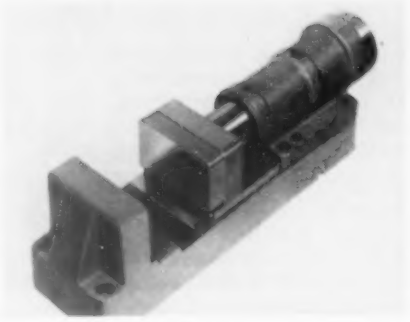
Capacity is 14 x 8 in., readings 0.0001 in., and accuracy of slide locations claimed to be 0.00015 in. This borer, which is said to combine the most advantageous features of the larger and the small types of jig boring machines, can be used for production work when the cost of jigs is not warranted. All operations such as centering, marking out and checking can be carried out with the maximum guaranteed accuracy. **T-2-9**

Hydraulic Punching Units

A complete line of standardized Hydraulic Punching Units is announced by Progressive Welder Co., 3050 E. Outer Drive, Detroit 34, Mich. Compact and said to be capable of delivering almost 1/3 more force than usual in cylinders of the same size, these units may be used for production jobs involving punching, shearing, notching, trimming or forming, thereby eliminating need for large presses and cam or other costly dies.

The units are available in 8 different types of base mountings—closed end; open end; floating type; rocker type; front or rear end flange mount; open end two guide pin type; and open end three guide pin type—and are standard in 2, 3, 4, 5 and 6 in. diameters and stroke lengths of 1, 2, 3, 4, 5 and 6 in.

Among features of the line is complete interchangeability of cylinders on the various types of bases. This permits almost complete equipment salvage when retooling a job. Innovations in the hydraulic system include positive hydraulic return of the piston, incorporated within the unit without increasing size or weight. Dash-pot cushioning at both ends of the stroke prevents piston slap, thus reducing shock. A drain port immediately inside the outermost sealing ring drains any "leakage."



The pistons, of sleeve construction, provide full length guides during the stroke to maintain high precision of punch alignment and to permit accurate off-center punching. **T-2-10**

You know that Multiple Drilling slashes production costs. But do you know that the

THRIFTMASTER *"Universal"*

IS THE

Highest Quality

• • •

Lowest Price

UNIVERSAL DRILLHEAD

2-6 Spindles from $158.00 Immediate Delivery

TWENTY-FIVE YEARS of drillhead engineering experience is built into the rugged power of Thriftmaster heads. Quantity production, combined with modern equipment and skilled craftsmanship result in minimum prices. Check these important features:

• • •

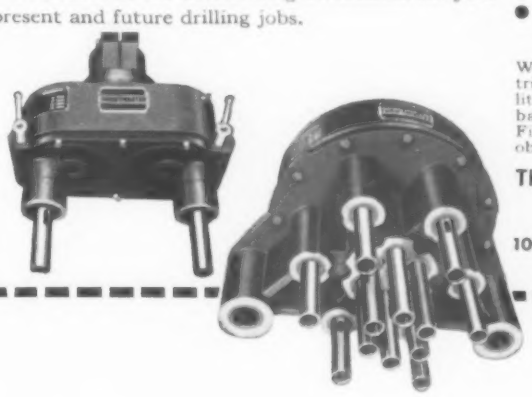
The superior construction of these versatile tools marks them as the outstanding investment for your present and future drilling jobs.

- **Adjustable to any hole pattern**
- **Fits any drill press**
- **Close center distance Settings**
- **Maximum flexibility**
- **Proven performance**
- **Long life at full rated capacity**

Write for name of our distributor in your area and for literature on Thriftmaster full ball-bearing Adjustable or Fixed Center Drillheads. No obligation, of course.

Thriftmaster Products Corporation

1038 N. Plum St., Lancaster, Pa.

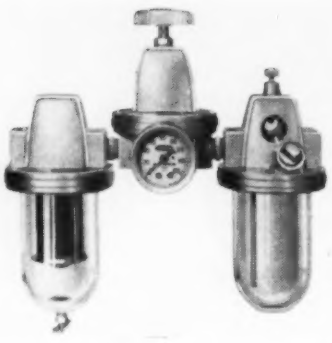


Air Conditioning Unit

An improved Combination Unit for conditioning compressed air prior to its use in tools, cylinders, and other air powered equipment is announced by Hannifin Corporation, Chicago 24, Ill.

This "Air Warden" filter, pressure regulator, and lubricator is a compact assembly that first cleans and purifies the air, automatically controls its pressure, and then adds atomized oil for the internal lubrication of moving parts in air powered equipment.

Weighing approximately ten pounds, the complete unit occupies only 12 in. of space in the air supply line and, because of its small size and moderate cost, may be practically used as a separate unit

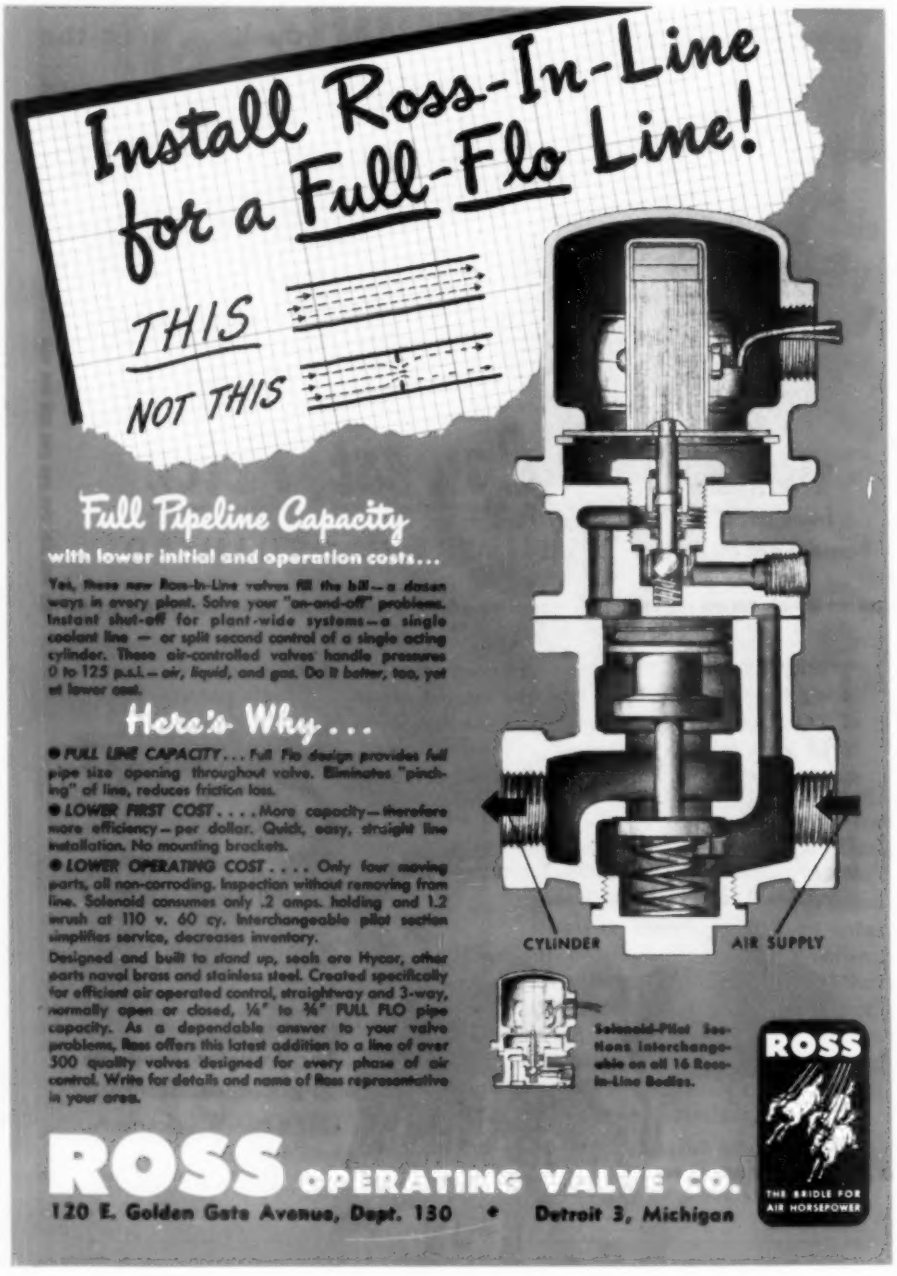


for each individual air consuming tool or cylinder served.

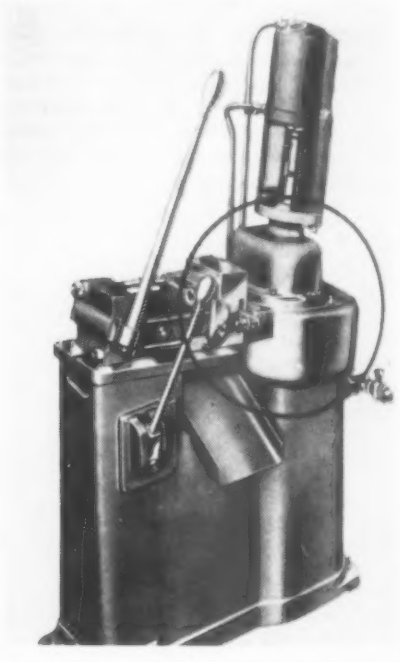
The "Air Warden" filter, which is said to provide continuous micronic edge filtration of dirt, scale, and abrasive impurities as small as 50 microns, also embodies a novel whirlwind baffle action that effectively eliminates moisture and emulsified oil. The pressure regulator has a "free floating" valve stem that protects against accidental pressure build-up and permits "backing off" or reducing pressure without.

As with the other components, the lubricator is constructed completely of non-corrosive materials and is suitable for use on primary air pressures up to 150 psi. Operation is visible, as is the oil level in the transparent bowl, and the oil supply can be replenished at any time; removal of the filling plug automatically shuts off the supply and releases air pressure in the bowl. Oil is injected only when air is flowing. The complete air conditioning unit is available in standard ¾ and ½ in. sizes, with other sizes furnished on application.

T-2-11


Install Ross-In-Line for a Full-Flo Line!
THIS
NOT THIS
Full Pipeline Capacity
with lower initial and operation costs...
Yes, these new Ross-In-Line valves fill the bill—a dozen ways in every plant. Solve your "on-and-off" problems. Instant shut-off for plant-wide systems—a single coolant line — or split second control of a single acting cylinder. These air-controlled valves handle pressures 0 to 125 p.s.i.—air, liquid, and gas. Do it better, too, yet at lower cost.
Here's Why...
● FULL LINE CAPACITY... Full Flo design provides full pipe size opening throughout valve. Eliminates "pinching" of line, reduces friction loss.
● LOWER FIRST COST.... More capacity—therefore more efficiency—per dollar. Quick, easy, straight line installation. No mounting brackets.
● LOWER OPERATING COST.... Only four moving parts, all non-corroding. Inspection without removing from line. Solenoid consumes only .2 amps. holding and 1.2 inrush at 110 v. 60 cy. Interchangeable pilot section simplifies service, decreases inventory.
Designed and built to stand up, seals are Hycar, other parts naval brass and stainless steel. Created specifically for efficient air operated control, straightway and 3-way, normally open or closed, ¼" to ¾" FULL FLO pipe capacity. As a dependable answer to your valve problems, Ross offers this latest addition to a line of over 300 quality valves designed for every phase of air control. Write for details and name of Ross representative in your area.
CYLINDER
AIR SUPPLY
Solenoid-Pilot Sections Interchangeable on all 16 Ross-In-Line Bodies.
ROSS
THE BRIDLE FOR AIR HORSEPOWER
ROSS OPERATING VALVE CO.
120 E. Golden Gate Avenue, Dept. 130 • Detroit 3, Michigan

Modified Die Casting Machine



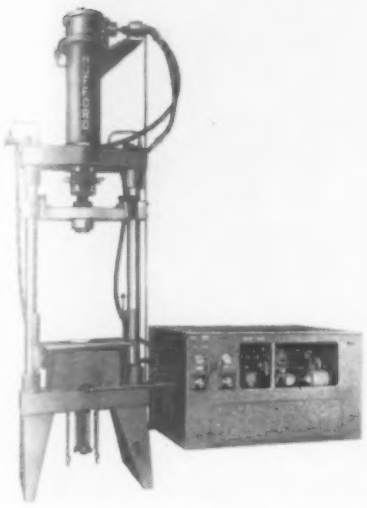
Model M55″/HF, smallest high-speed die casting machine produced by DCMT Sales Corp., 315 Broadway, New York 7, N. Y., has been modified to handle all standard zinc alloys as well as lead and tin based metals.

The versatility of this Pressure Die Casting Machine is said to be made possible by a hydro-action nitra-alloy lined pot—circled—which uses hydraulic suction to fill the cylinder. A porthole at the base permits all the metal in the pot to be used before refilling becomes necessary.

The machine, which is air-operated, utilizes low-cost, single cavity dies operating at high speed and is said to bring pressure die casting within the range of manufacturers who have heretofore been unable to use this process, owing to the cost of multi-impression dies. A production rate of 20,000 "shots" per week is claimed.

T-2-12

Rotating Tool Press

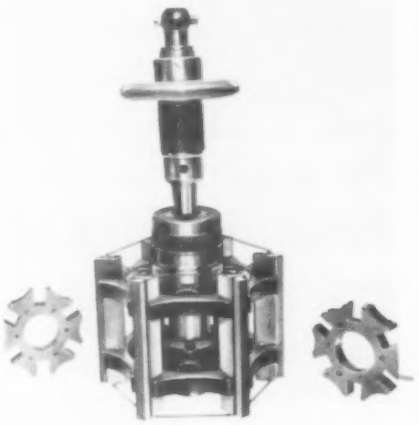


A Rotating Tool Hydraulic Press, by Hufford Machine Works, Inc., Redondo Beach, Calif., is also applicable to general pressing and forming operations of plastic materials, especially where a combination of controlled tool rotation and pre-regulated pressing tonnage is advantageous.

The unit provides for two basic operations: (1) where a rotating tool must press and simultaneously descend and ascend to form an accurate thread, and (2) where the forming operation is accomplished by forcing work against a fixed, rotating tool.

The unit can be operated as a manually controlled single-cycle unit, or as a continuously cycling unit delivering any desired pattern of interlocked motions. Interlocking, with claimed assured repetition of any desired cycle, is obtained with a "mechanical brain" employing cam-driven hydraulic valves which control sequence of ram and tool motions. **T-2-13**

Precision Honing Tools



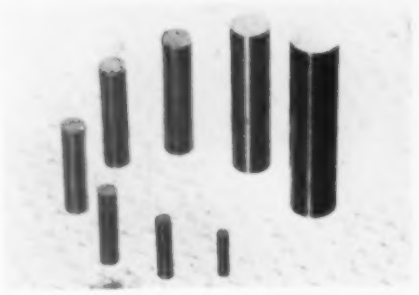
C. Allen Fulmer Co., 1211 First Nat'l. Bank Bldg., Cincinnati, Ohio, is general distributor, throughout the United States, for the Alexander Ball line of British-built honing tools.

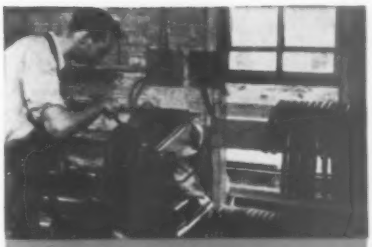
These tools are designed to produce round, straight bores to close tolerances, and to assure fast stock removal by honing. Also, due to automatic stone compensation, the stones are said to be automatically dressed to a perfectly cylindrical surface. The hones are available in sizes from ½ in. to 50 in. diameter in types to finish open bores, ported cylinders or blind holes. **T-2-14**

Solid Carbide Cylinders

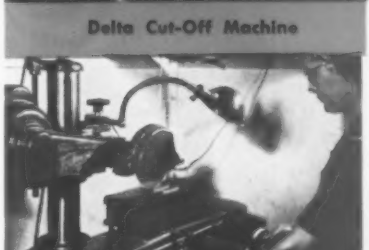
A standardized line of solid carbide Cylinders, both ground and unground, by Carboloy Co., Inc., Detroit, Mich., is comprised of 115 sizes.

Among the wear-resistant uses for these cylinders are burnisher rolls, knurl roll pins, locating devices, plunger ends, and other uses. The cylinders may also be used as round bits for "insert" tools used for semi-finish and finish facing, straddle facing, and multiple turning of metals and many non-metallic materials. **T-2-15**





Delta Cut-Off Machine



Delta Toolmaker® Surface Grinder

Easy to Operate

—that's one reason why Delta®-Milwaukee Machine Tools pay off for this bike builder

DELTA MILWAUKEE®

Women machine-operators easily grind their own cutters, with the Delta Toolmaker Surface Grinder at the Weller Products Co., Milwaukee, Wis.

This company makes a child's tricycle known as "Kar-Bike." It is an all-steel, scientifically-designed bike, precision-made with Delta tools and special cutters.

In addition to showing the easily-operated surface grinder, the illustrations here picture the Delta Cut-Off Machine cutting frame tubing for "Kar-Bike" . . . and a Delta Drill Press tapping small steering-gear parts.

Many another plant has learned that the operating simplicity of Delta-Milwaukee Machine Tools helps to increase production — with safety. Your Delta distributor can suggest ways that low-cost Delta tools can save *you* time and money. Ask him about buying on easy time payments. Look for his name under "Tools" in the classified section of your telephone directory.

Send coupon for descriptive literature.

*Trade Mark Reg. U.S. Pat. Off.

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610B E. Vienna Ave., Milwaukee 1, Wis.
Please send free bulletins I have checked:
☐ Bulletin A-17 on drill presses.
☐ Bulletin A-23 on surface grinders.
☐ Bulletin A-20 on cut-off machines.

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Announcing A New LOW COST Ball Bearing for Your

LINEAR MOTIONS

BALL BUSHING

THE COMMERCIAL GRADE SERIES B

Sliding linear motions are nearly always troublesome. Thousands of progressive engineers have solved this problem by application of the Precision Series A Ball Bushing.

The low-cost Commercial Grade Series B bearing is now added to the Ball Bushing line and offered to original equipment manufacturers. This ball bearing has been developed for support of linear motions in competitively priced, volume produced products where super precision is not essential. Alert designers can now make tremendous improvements in their products by using Ball Bushings on guide rods, reciprocating shafts, push-pull actions, or for support of any mechanism that is moved or shifted in a straight line.

Competition is returning. Up-to-date engineering can be *important to you!*

- **LOW FRICTION**
- **ELIMINATE BINDING AND CHATTER**
- **SOLVES SLIDING LUBRICATION PROBLEMS**
- **LASTING ALIGNMENT**
- **LOW MAINTENANCE**
- **LONG LIFE**

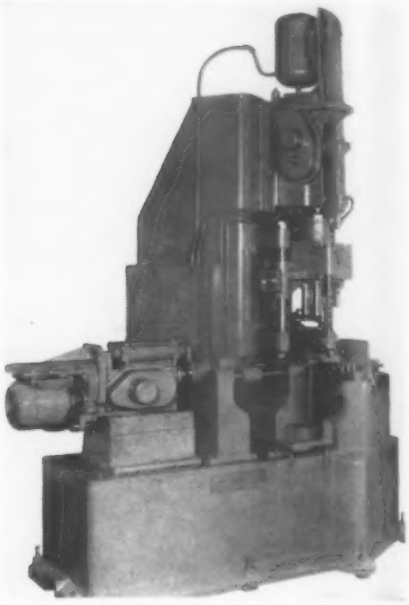
NOW AVAILABLE for ¼", ½", ¾" and 1" shaft diameters. Additional sizes to follow. Write for new literature covering both the Series A and Series B Ball Bushings and the name of our representative in your city. No obligation.

THOMSON INDUSTRIES, INC.

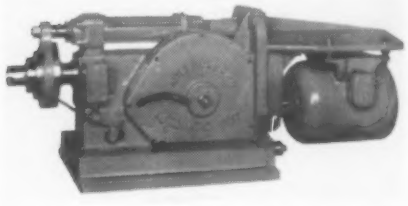
Dept. A *MANHASSET, NEW YORK*

PROGRESSIVE MANUFACTURERS USE BALL BUSHINGS— A MAJOR IMPROVEMENT AT A MINOR COST

Automatic Index Machine



An automatic Index Machine—the No. 5, by W. K. Millholland Machinery Co., 1048 Fairfield Ave., Indianapolis 5, Ind.—incorporates, in the vertical position, the redesigned No. 5 Millholland Automatic Unit shown in the smaller photo. This unit has a 10 HP motor and 6 in. stroke. The horizontal side head is the No. 4, with 5 HP motor and 5 in. stroke.



The automatic index table is independently driven and synchronized, with the movement of the units effected by means of limit switches. The table may be had in sizes up to 42 in. with indexes up to 600 or more per hour.

The machine is arranged for continuous or intermittent operation by pushbutton control, the operator being only required to load and unload the fixtures. **T-2-16**

Fast Spiral Carbide Drill

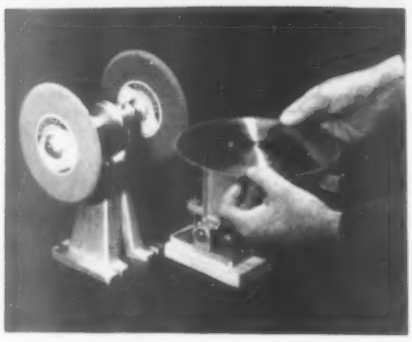
A line of Fast-Spiral Drills, carbide tipped, in sizes 3/16 to ½ in. included, is offered by Super Tool Company, 21650 Hoover Road, Detroit 13, Mich.

The drills are available in corresponding letter and wire sizes, have straight shanks and are designed to fill an industrial requirement for a carbide tipped drill which will work satisfactorily on deep hole drilling in aluminum, magnesium and soft plastics.

This line is offered as an addition to standard Super carbide drill line and at the same prices for comparative sizes. **T-2-17**

Saw-Indexing Fixture

A saw sharpening fixture, which holds and turns a circular saw while grinding the teeth, has been announced by Treyco Products, Buffalo 17, N. Y. When the fixture is accurately mounted on the same base with a power-driven bench grinder, the entire saw sharpening equipment becomes a precision unit.



Using a grinding wheel with a 45-deg. angle on one side, cross cut or fine teeth on a combination saw may be sharpened. With a 5/16-in. grinding wheel with a radius, rip saws and large teeth on combination saws may be sharpened.

The Treyco fixture is designed so as to insure the saw being perfectly round after sharpening. Saw teeth are brought up to the grinding wheels at exact right angles, and indexing stops are adjustable for various sizes and types of saws. **T-2-18**

Lo-Temp Repair Alloy

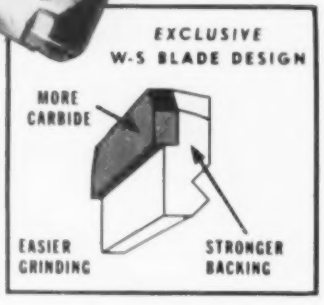
A strong permanent repair metal alloy that can be machined and handled at a low temperature, "Lo-Temp" is available from The John Hewson Company, 70 Wall St., New York 5. This bronze base alloy is said to handle like putty at only 300 deg. and fuses with the metal surface under repair. It is stated that the finished repair can be machined, filed, drilled and tapped, and that the low temperature will not cause crystalization or distortion.

Lo-Temp does not corrode, run, crumble, shrink, or dry out, and may be used with any metal except aluminum or its alloys. An ordinary gasoline torch and a putty knife is the only equipment necessary to make permanent repairs. **T-2-19**

For better tooling at reduced cost

WENDT-SONIS carbide tipped *adjustable* REAMERS

Design of Wendt-Sonis Adjustable Reamers assures outstanding performance of reaming operations. Cuts are smooth and true to close tolerances. Generous chip clearance allows maximum stock removal. Only selected materials, carefully heat-treated, are used in W-S Adjustable Reamers.



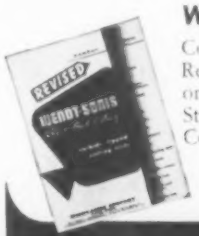
REPLACEABLE CARBIDE-TIPPED CUTTING BLADES — A new tool can be had by replacing worn blades. One piece of carbide, heavily backed with high speed steel, runs the full length of blade. Diamond lapped cutting edges insure free cutting action — longer life.

ADJUSTABLE TO CLOSE TOLERANCES — Threads precision ground from the solid permit close blade adjustment. Maximum expansion allows greater number of re-grinds per tool. Special safety lock-nut permits easier replacement and positive locking of inserted blade.

AVAILABLE IN THREE STYLES — Straight shank, taper shank and shell type for reaming any type of material. Also available in right and left hand spiral flutes in straight and taper shank styles. A wide range of sizes for almost every reaming job.

Write for W-S Catalog No. 646 Revised

Contains complete details and latest prices on W-S Adjustable Reamers. Write: WENDT-SONIS COMPANY, Hannibal, Missouri; or 580 North Prairie Ave., Hawthorne, Calif.; 1561 West Lake St., Chicago, Illinois. Warehousing Facilities: Eastern Carbide Corp., 909 Main St., New Rochelle, N. Y.



WENDT SONIS

CARBIDE CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS
DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS
ROLLER TURNING TOOLS • SPECIAL BITS

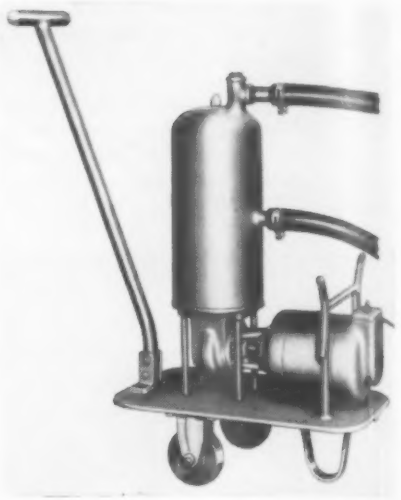
New for '49
SUPER
SUPER
FAST SPIRAL
Carbide Tipped
TWIST DRILLS
For more efficient drilling in aluminum, magnesium, bakelite, plastics, etc. Standard in sizes 3/16" to 1/2". Also sizes 1/16" to 1/4" in solid carbide.
NEW
Carbide Tipped
CORE DRILLS
A hard wear strip back of each carbide tip extends full length of flute effectively preventing galling or scoring. Increases life of drill and improves finish. Standard in sizes 1/2" to 1-1/2".

Send for Bulletin

SUPER TOOL CO.

21630 Hoover Rd., Detroit 13, Michigan 5210 San Fernando Rd., Glendale 3, California

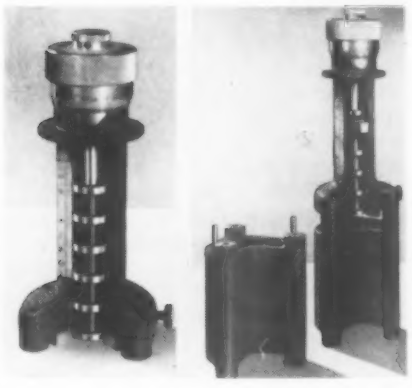
Repriming Pump Unit



A portable Rumaco Repriming Pump Unit—Model "R," by the Ruthman Machinery Company, Cincinnati 2, Ohio—is designed for pumping out dirty cutting oils or coolants from machine tool sumps. It is also a handy transfer pump for clean liquids as well.

A centrifugal pump and an integral repriming tank provide simple and trouble-free operation. Capacity is 40 GPM at 3 ft. difference in level from suction nozzle to discharge level when equipped with 10 ft. suction and 10 ft. of discharge hose. **T-2-20**

Pla-Check for Small Work

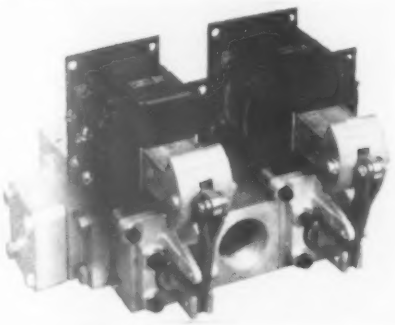


A portable 6 in. Pla-Check Gage, by Cadillac Gage Company, 20315 Hoover Rd., Detroit 5, Mich., is designed primarily for checking smaller gages, tools and dies, either at the machine or on the surface plate.

The gage can also be used on larger jobs, without sacrifice of portability, by the addition of 6 in. risers which do not change the overall 0.00005 in. accuracy claimed for this gage. **T-2-21**

Turn to Page 80
for Handy
Tools of Today
Coupon

Dual Pressure Selector Valve



An electrically-operated dual-pressure Selector Valve, by Saval, Inc., 1915 E. 51st St., Los Angeles 11, Calif., incorporates design features to meet the need of manufacturers contemplating conversion of semi-automatic and manually operated hydraulic equipment actuated by low and high pressure accumulator systems.

Designed specifically for water pressures to 7000 psi, the valve may also be used on oil or air. Although compact in design, the valve will accommodate screwed, welded, or flanged connections up to 2 in. on pressure ports and 2½ in. on the return port.

Responsive and rapid acting, this valve is claimed to eliminate the danger of wrecking costly dies due to override, and may further be used to accurately limit top working pressures.

T-2-22

THE HARD
WAY
GETS YOU MORE
Right—gets you more production—more for your money. For long wear and close tolerances specify OHIO WAYS. Uniformly hardened to Rockwell 64 to 66 C scale.
The OHIO KNIFE Co.
CINCINNATI 23, OHIO, U. S. A.

Where
CUTTING FLUID

SELDOM does the most carefully developed scientific theory provide the final answer in the shop; neither is practical experience entirely dependable. It usually takes a combination of both in order to select and apply the cutting fluid that will give the best results on a given machining job.

D. A. Stuart Oil Company offers you a combination of theory and practical experience that pays dividends in better machining and fewer production headaches. The *theory* emanates from research in the modern D. A. Stuart laboratories; *practical* approach comes from men who have years of experience in shop problems and techniques. That is why Stuart products so often smooth out jobs on which other cutting fluids fail. Ask your D. A. Stuart Oil Co. representative to tackle your tough jobs.

ON-THE-JOB REPORTS PROVE RESULTS

". . . D. A. Stuart's SOLVOL Water Mixed Cutting Compound was put in on a trial basis for milling high carbon alloy steel. High speed alloy cutters were used and it was found that SOLVOL increased the cutter life 3 to 4 times over what they had been getting. . . ." Write, if you would like to have a booklet on SOLVOL.

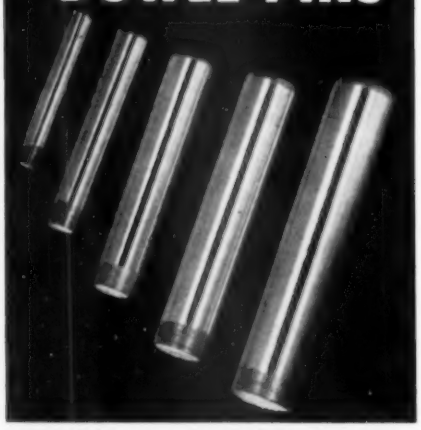
STUART *oil engineering goes with every barrel*

D.A. Stuart Oil CO.

2727-49 S. TROY ST., CHICAGO 23, ILLINOIS

Save time-Specify

DANLY PRECISION DOWEL PINS



HARDENED AND PRECISION GROUND—CAN BE DRIVEN WITHOUT UPSETTING

Wherever parts must be accurately joined or held together, you can depend upon Danly Precision Dowel Pins to save time. Because they're hardened, they can be driven in or out of holes without upsetting. They assure an accurate fit because they are precision ground to limits of 0.0001".

A WIDE RANGE OF SIZES are available in both standard diameters for new work and in .001" oversize for repair work. They are accurately marked and packed in substantial containers for your fast and convenient use.

SIMPLIFY TOOL, DIE, AND GAGE MAKING WITH THESE DANLY PRODUCTS

Hollow Set Screws—provide maximum tightness with shakeproof qualities—class 3 fit is Danly standard. Standard, self-locking knurled point, and knurled thread types available.

"Kwik-Klamp" Toggle Clamps speed handling of light work, eliminate T-bolts and clamps, C-clamps, screws and jacks. Versatile types and sizes with holding pressures from 300 to 750 lbs.

Die Springs—Two interchangeable types—one for medium pressure—high deflection, and one for high pressure—medium deflection work to best suit job needs.

Knurled Socket-Head Cap Screws—full range of sizes. Class 3 coarse or fine threads speed assembly work, insure precision fit.

Socket-Head Stripper Bolts made to close limits, insure better fitting and positive tightening without shearing.

Write Dept. 298 for *free* literature

DANLY MACHINE SPECIALTIES, INC.
2240 So. 52nd Ave. Chicago 50, Ill.

DANLY

MECHANICAL PRESSES • DIE SETS • DIE MAKERS' SUPPLIES

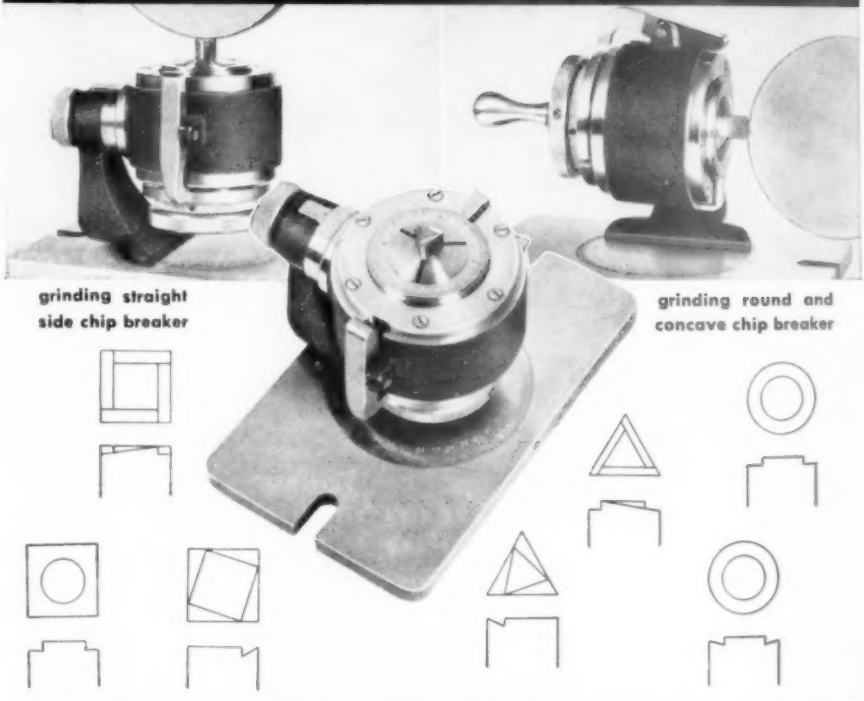
Die Thread Roller

The Reed Rolled Thread Die Co., 237 Chandler St., Worcester 2, Mass., announces the Reed A32 Cylindrical Die Thread Roller, which extends the application of thread rolling to 4 in. diameter threads. This addition to its line of cylindrical die type of thread rollers enlarges the field of their thread rollers, on heat treated steels and other types of materials, to thread sizes which heretofore could not be rolled due to limitations of thread rolling equipment capacity available.

The machine is of the horizontal type and, being compact, occupies relatively little floor space. The work blank is supported and positioned horizontally between three synchronously rotating cylindrical dies which act on the blank simultaneously and hold it rigidly in proper rolling position.

The rolling pressure causes the material to follow the pattern of the dies which always remain in match during rolling. Thread form and lead are, therefore, controlled to close limits by "matched" precision-ground cylindrical dies. T-2-23

IT SIMPLIFIES GRINDING OF CHIP BREAKERS ON YOUR SOLID CARBIDE INSERT BITS



grinding straight side chip breaker

grinding round and concave chip breaker

A NEW, COMPACT, PRECISION FIXTURE *SAVES TIME! INCREASES ACCURACY!*

Accurate grinding of any type chip breaker, round or straight, flat or concave—enables you to take full advantage of economies of new type tools using replaceable solid carbide insert bits. Fixture is only 5½" from table to collet face in vertical position—is ruggedly constructed with preloaded ball bearing spindle, ground in the fixture to assure perfect alignment.

Write for Literature

ROYAL OAK TOOL AND MACHINE CO.

621 East Fourth Street • Royal Oak, Mich.

Adjustable Drillhead

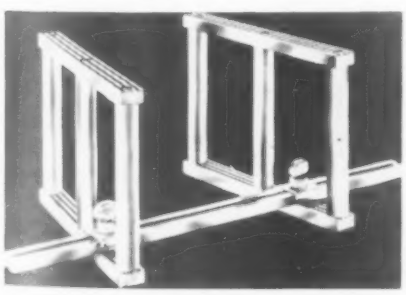
The Thriftmaster Products Corp., Lancaster, Pa., announces a universal-joint type Adjustable Drillhead—The Thriftmaster U620B—designed specifically for close center drilling. The unit, which is adaptable to any drill press, is adjustable to 11/16 in. minimum center distance on any pattern within a 6-⅝ in. diameter circle.

Spindles are regularly furnished with collet chucks, and collets can be furnished for drills between 1/32 and ¼ in. Spindles are also available with No. 1 Morse taper sockets.

The gear housing is completely sealed against entrance of grit or abrasives and leakage of lubricants. The U620B is available in two to six spindles and, operating on a 1:1 ratio, is designed for right hand rotation of the drill press. Weight of the 6-spindle drillhead is approximately 21 lbs. **T-2-24**

Safety Parallel Units

A safely Parallel Unit, by Acro Die and Stamping Co., 5328 N. Kedzie Ave., Chicago 25, Ill., is designed to eliminate makeshift methods of supporting parts for various operations.



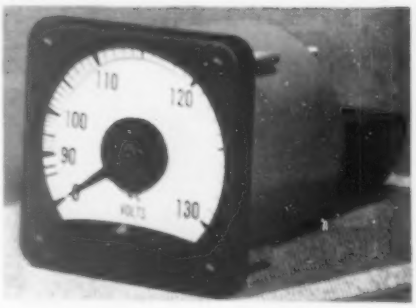
The device consists of two parallel units joined together on an adjusting rail with only two thumb screws to manipulate for quick adjustment to any desired spread.

Hardened and precision ground, the tool is available in standard 3, 5, and 7 in. heights, 20 in. spread, and comes in standard as well as heavy duty types. **T-2-25**

Expanded Scale Voltmeter

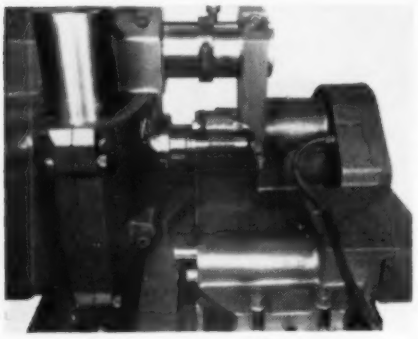
An indicating Voltmeter with an expanded scale, announced by General Electric Company's Meter and Instrument Division, is an addition to the Type AB-15 line.

Designed for general switchboard use by electric utilities and large industries, this meter has a scale 7.1 in. long spanning 250 degrees about the center. The scale is expanded over the most frequently used range—that is, from 90 to 130 volts—thereby enabling easy detection and measurements of 0.5-volt variations within that range. Accuracy has been determined to within ± ½ per cent in the range of 105 to 125 volts and



± 1 per cent over the entire expanded range. Although available in only one rating—0-90 to 130 volts—it can be supplied with scales applicable to potential transformers for voltages higher than rated. **T-2-26**

Automatic Index Fixture

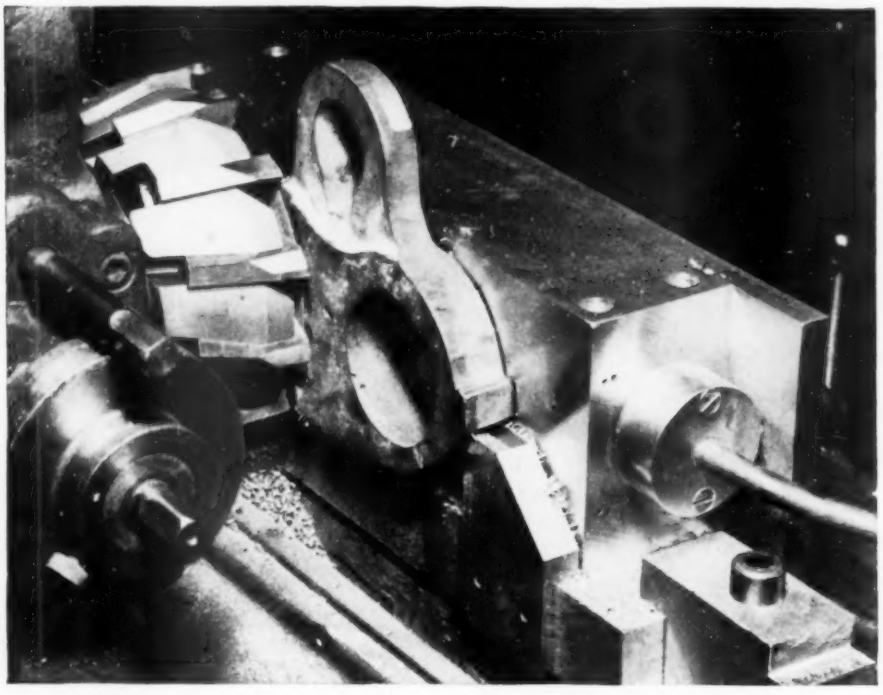


Kent-Owens 2-20 milling machines

can now be arranged with automatic Index Fixtures and all necessary tooling for milling irregularly spaced vent slots in piston rings. One such machine has been built for Segments Grenier, France, by the Kent-Owens Machine Co., Toledo, Ohio.

A group of rings are mounted on an adaptor which is placed in the fixture and the table feed is then engaged. The balance of the operations, including milling and indexing, are completely automatic. After the last slot has been milled the fixture—or table of the machine—will return to the loading position and stop. Additional work holding adaptors are supplied so that the unloading and loading of the rings on the adaptor can be handled while the rings in the fixture are being milled.

The machine has a 42 x 12 in. table, with 20 in. table travel and twelve spindle speeds ranging from 64 R.P.M. to 860 R.P.M. available. Drive, taken from a standard foot mounted ball bearing motor at the rear of the machine, is simple and direct, with only two gear contacts from motor to cutter. T-2-27



Loading Time Reduced to an Instant Milling Castings with Power-Grip Holding

Illustration shows Power-Grip Chuck holding rough cast iron casting for milling. Cut is ⅛" deep, with 6" dia. Carbide tipped face milling cutter at 272 r.p.m., and feed at 16" per minute.

Power-Grip Chucks are an easy solution to many problems of holding castings. Simple, inexpensive adaptors can be made for castings of odd shapes and sizes. Work is set in accurate position, ready for milling, instantaneously. Reducing loading and unloading time to the extreme minimum means eliminating the major portion of the cost of most milling jobs, and with Power-Grip Chucks this can be realized quickly.

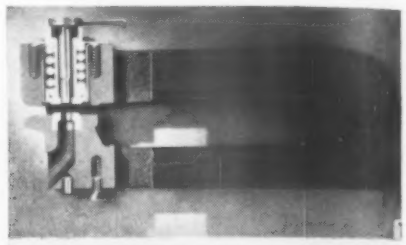
You can learn the possibilities for any job by sending us prints and operating data, so we can submit a complete proposal for Power-Grip Holding.

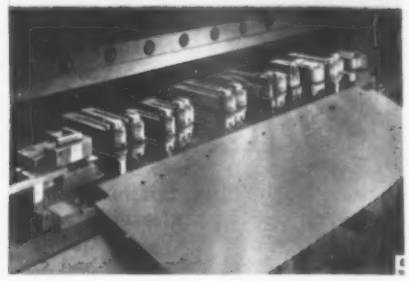
ROCKFORD MAGNETIC PRODUCTS CO., INC.
1304 18th Avenue, Rockford, Illinois

Send for This Booklet

ROCKFORD POWER-GRIP CHUCKS

Improved Hole Punching Units

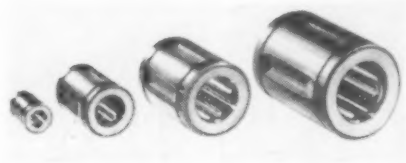




Wales-Strippit Corp., North Tonawanda, N. Y., announces an improved line of Type "BL" Hole Punching Units with punch retainers. The units are independent and self-contained, and may be mounted singly or in groups to obtain practically unlimited patterns. They may be mounted and locked in exact position, on templates or T-slotted plates, in stamping presses or press brakes.

The units are shown in cut-away view in the upper photo, with a typical setup in the lower illustration. To all practical purposes, these units are "subpress" dies, each complete in itself. T-2-28

Linear Ball Bearings



Thomson Industries, Inc., Manhasset, N. Y., announces a lower-priced version of its linear motion ball bushings. Called the Series B Commercial Grade Ball Bushings, these bushings have somewhat less accuracy and load bearing capacity but are otherwise built to the same basic dimensions and have the same free-rolling characteristics as the precision type.

They are said to be particularly applicable to linear motion mechanisms, where they provide long life and low maintenance cost. T-2-29

. . . in one setting . . . in 10 minutes . . . 19 separate operations!

ON THE POTTER & JOHNSTON 6DRE AUTOMATIC

—that's tooling for you

—the kind of time and money saving tooling that production-minded executives and engineers have learned to look for when they put it up to Potter & Johnston.

You can never be sure that your parts production is accomplished the fastest, most accurate, most economical way until you let P&J engineers have a look at the parts or prints and compare their tooling recommendations and time estimates with what you're doing now. Why not see what they have to say. It puts you under no obligation.

The Steel Forged Oil Well Drill Bit pictured above is gripped by a 3 jaw chuck, and here is what happens to it on the P&J 6DRE Automatic:

1st T. F.: Drill inside dia. to depth; turn O.D. straight to chuck jaws; remove portion of stock from bevel.

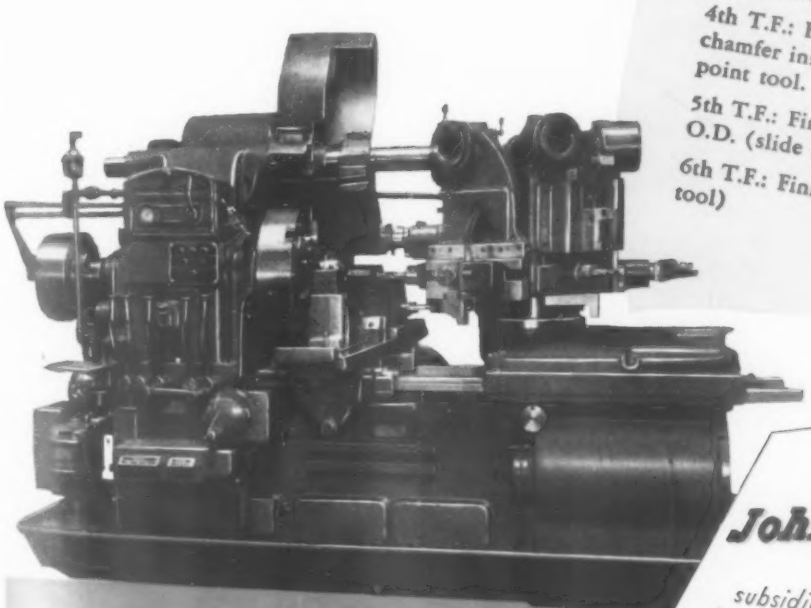
2nd T. F.: Rough bore two inside dias. and face bottom of one dia.; remove portion of stock from bevel.

3rd. T.F.: Form radius and angle on outside dia.; remove remaining rough stock from bevel; rough face end; rough C'bore 3.798" dia.

4th T.F.: Finish bore three inside diameters, chamfer inside dia.; machine bevel with single point tool.

5th T.F.: Finish bore inside dia.; turn taper on O.D. (slide tool)

6th T.F.: Finish face end; form ball race (slide tool)



Potter & Johnston Company

Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

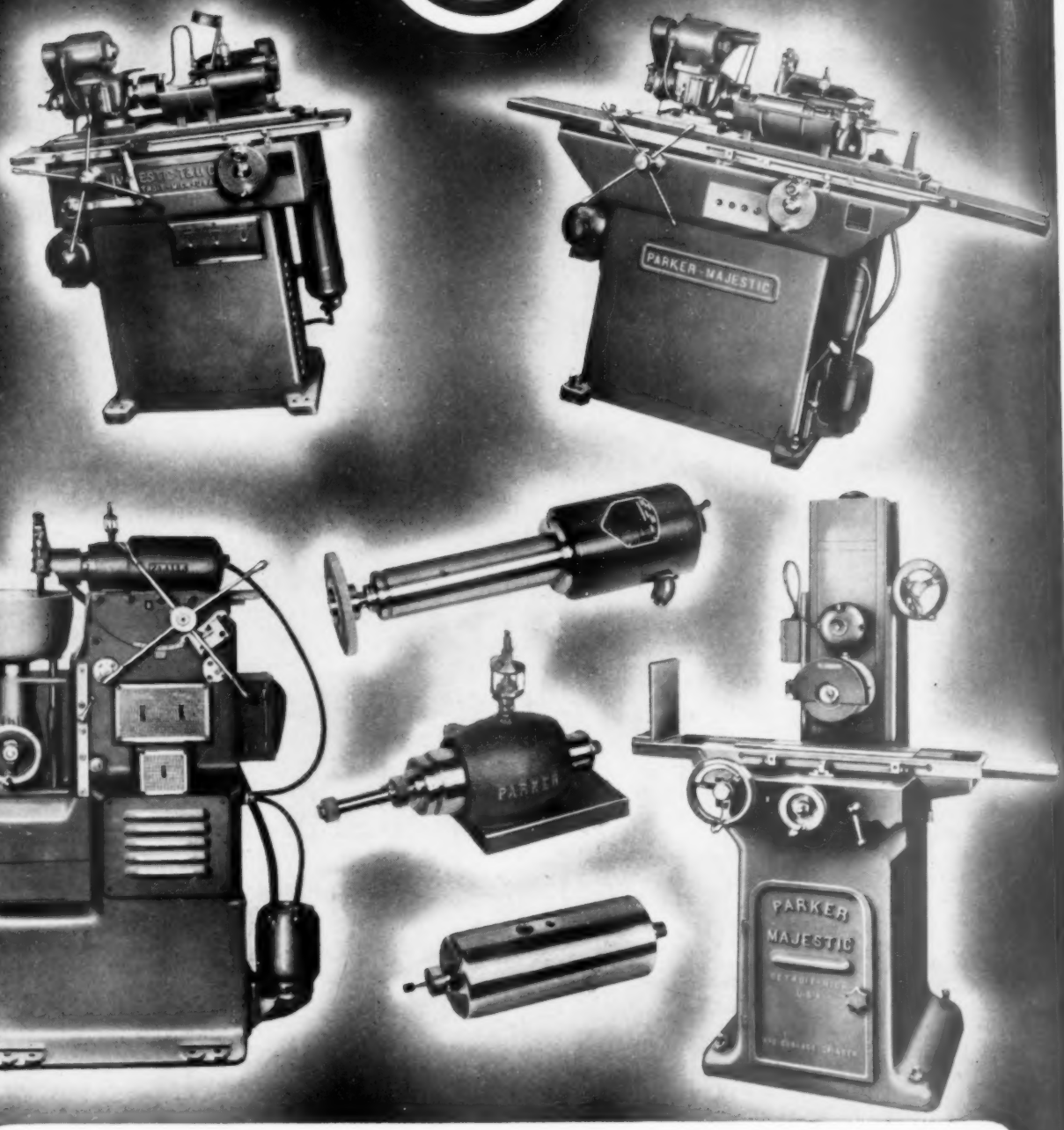
P&J

6DRE AUTOMATIC

PRECISION MACHINES

PM

PARKER • MAJESTIC



Since 1907, the name of Parker has been a part of the progress of the automobile industry.

In 1915, Parker introduced the basic principle of ball bearings in grinding manufacture—a major advance in grinding which was unknown at that time.

A few years later the Parker Ball Bearing was patented to meet high speed and precision requirements and has been in use ever since.

Further research and engineering development brought forth the well-known Parker Majestic External and Internal Grinding Machines, each machine representing a great advance in simplicity of operation and precision.

The latest tooling development of the company is the Parker Majestic No. 2 Surface Grinder that provides new accuracy and flexibility for small grinding operations.

These many products of Parker Majestic will continue to serve the great automotive industry in the future, keeping pace with its demands for speed, accuracy and dependability.

MANUFACTURED BY

MAJESTIC TOOL AND MANUFACTURING COMPANY

147 JOS CAMPAU • DETROIT 7, MICHIGAN

Free-important new catalog

O K TOOL 3600 CARBIDE
DUAL ADUSTABLE
FACE MILLS, END MILLS, SHELL END MILLS
First Showing of the New
FREE-CUT FACE MILLS

These new cutters incorporate a combination of angles to obtain desired chamfer or lead angles for new high speeds and feeds.

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THE O. K. TOOL CO., INC., Shelton, Conn.

THE O. K. TOOL COMPANY, INC.
SHELTON, CONN.

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For your convenience a key number follows the announcement of each product reviewed in the *Tools of Today* section. To obtain complete information, circle the corresponding numbers on this coupon, and mail the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER, 550 West Lafayette Blvd., Detroit 26, Michigan

Gentlemen:

Please send me further information on the following Tools of Today items which I have checked:

T-9-1	T-9-2	T-9-3	T-9-4	T-9-5	T-9-6	T-9-7	T-9-8	T-9-9	T-9-10	T-9-11
T-9-12	T-9-13	T-9-14	T-9-15	T-9-16	T-9-17	T-9-18	T-9-19	T-9-20	T-9-21	T-9-22
T-9-23	T-9-24	T-9-25	T-9-26	T-9-27	T-9-28	T-9-29				

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Get STANDARD TAPERED END MILLS on the job *Fast!*

50 standard sizes of spiral tapered end mills for milling taper or clearance on dies, molds or patterns — or any machining where taper is needed.
Taper ½° to 7° per side, flute lengths ½" to 3½". Also special die sinking cutters.
Regular end mills in 2, 3, 4 flute. Get our price and delivery on specials.
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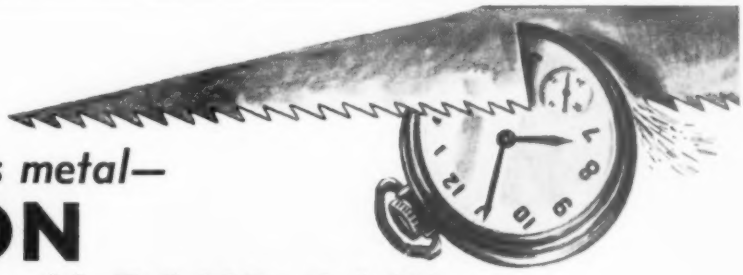
Cadillac Cutter Company
1813 EASTERN AVE. S.E. GRAND RAPIDS 7, MICH.

have we your right address?

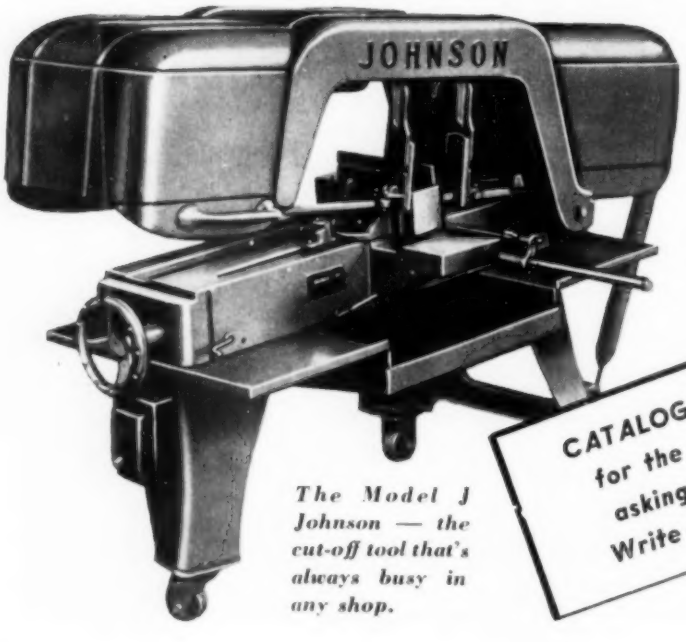
if you've moved, notify ASTE headquarters of your new address so that THE TOOL ENGINEER and other society information will reach you promptly. Write your NEW and OLD address on a penny postcard and mail to:

American Society of Tool Engineers
10700 Puritan Ave., Detroit 21, Michigan



It cuts off minutes as well as metal—

the JOHNSON
metal cut-off BAND SAW



The Model J Johnson — the cut-off tool that's always busy in any shop.

CATALOG for the asking Write —

Lock your stock in the vise, drop the saw to the work, throw the switch . . . and watch the non-stop endless blade of the JOHNSON shear down through the metal for a clean, fast, accurate cut-off job. . . . All controls at operator's finger-tips. Overall rigidity and extra-generous guide rolls help blades live long. Three-point suspension equalizes any floor.

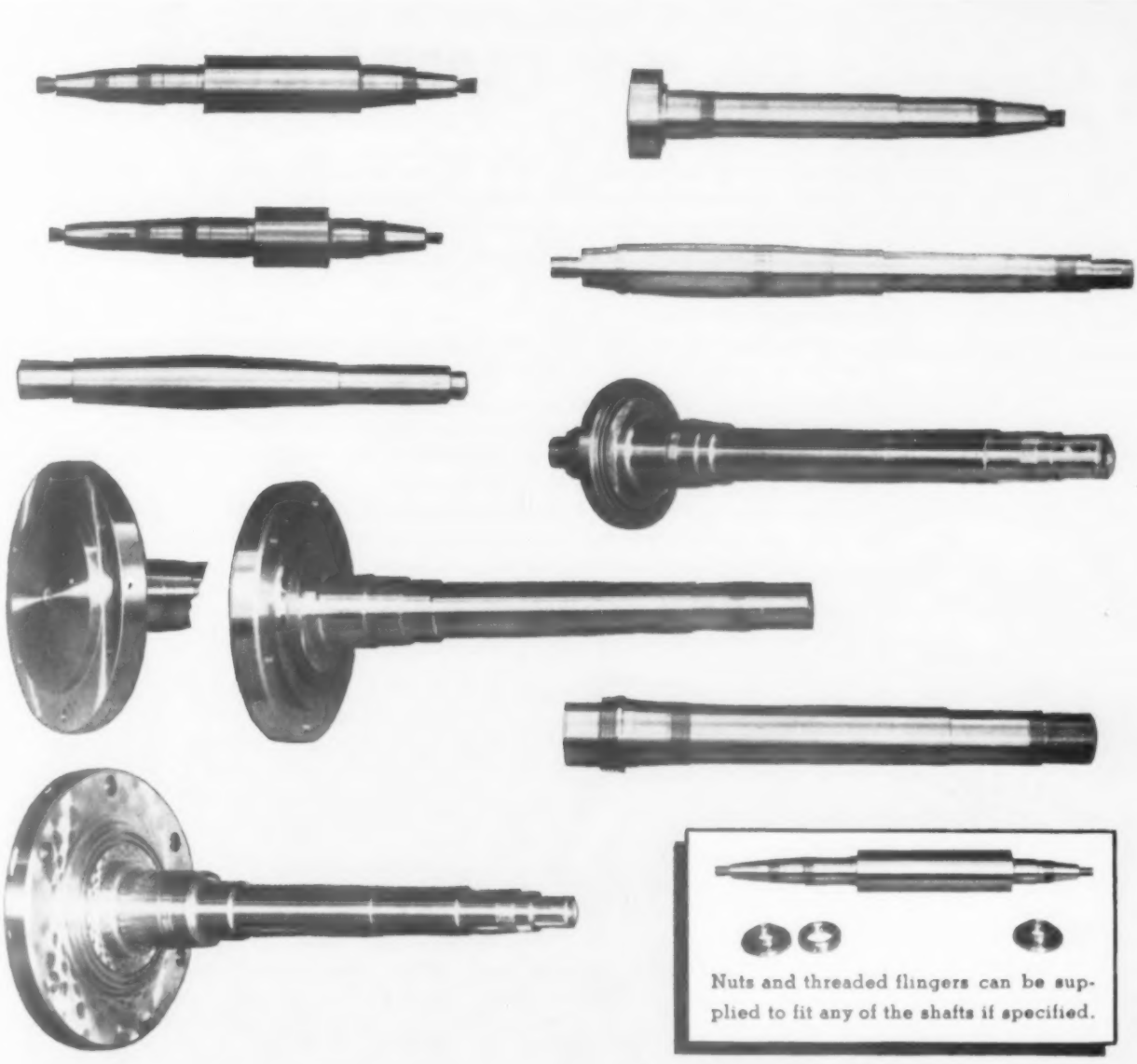
TWO TYPES—Model J, a heavy sturdy tool cuts 10" rounds, 18" flats. Model B, lighter, portable, of rigid twistproof construction, cuts 5" rounds, 10" flats.

JOHNSON
MANUFACTURING CORP.
627 CHRYSLER BUILDING
NEW YORK 17, N. Y.

POPE

PRECISION SHAFTS

We are now in a position to supply precision shafts made to your own designs and specifications as to material and tolerances, with ground threads and dynamically balanced if required.



Nuts and threaded flingers can be supplied to fit any of the shafts if specified.

Send us drawings and specifications and let us quote on your requirements

No. 57

POPE

TRADE MARK REG. U.S. PAT. OFF.

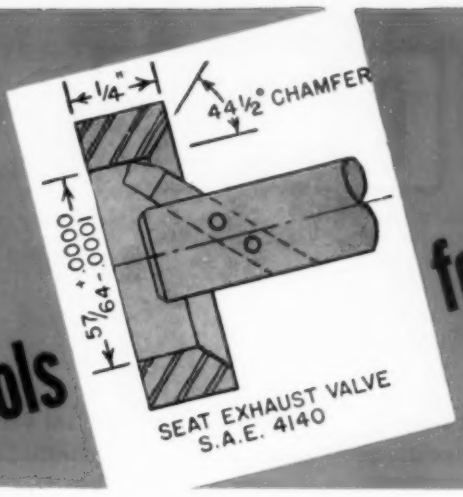
POPE MACHINERY CORPORATION

ESTABLISHED 1920

261 RIVER STREET • HAVERHILL, MASSACHUSETTS

BUILDERS OF PRECISION SPINDLES

2 tools for the price of 1



...when V-R CARBIDE Is On The Job

The measure of carbide quality is in the performance. That's one reason why V-R Carbide tools give you consistent results where less tool cost and high production are key factors to profitable metal cutting operations.

Here's how ONE V-R Carbide tool outperformed all other carbides 2 to 1 on a standard boring operation.

Increasing costs reduced the profit on an exhaust valve seat boring operation to a point where a manufacturer decided to test various carbides in an effort to increase production and reduce tool costs and down time.

Testing various carbides on a four spindle boring machine simultaneously, other carbides produced 24 pieces before tool failure. V-R Carbide grade 2A7 produced 48 pieces when the test was stopped. Examination of the V-R Carbide tool showed only a slight trace of wear.

It was this switch from other carbides to V-R CARBIDE that provided another manufacturer with a sure margin of profit on a non-profitable boring operation.

test performance data

MATERIAL:	S. A. E. 4140 Rockwell 37C	
MACHINE:	Excello Four Spindle Boring Machine	
OPERATION:	Precision bore diameter 57/64". Width 1/4". Chamfer 44-1/2° angle.	
	V-R Carbide Grade 2A7	**Other Carbides**
S. F. M.	275	275
FEED PER REV.	.003	.003
DEPTH OF CUT	.045	.045
PIECES PER GRIND	48	24

● Why not check your carbide tool operations today for that extra margin at no extra cost! Call your nearest Vascoloy-Ramet Branch Office for V-R's experienced tool engineering service. For the best results try V-R Carbide or Tantung Cast Alloy tools and blanks NOW.

District Sales and Service in Principal Cities

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vascoloy-ramet corporation

WAUKEGAN • ILLINOIS

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

N. A. WOODWORTH

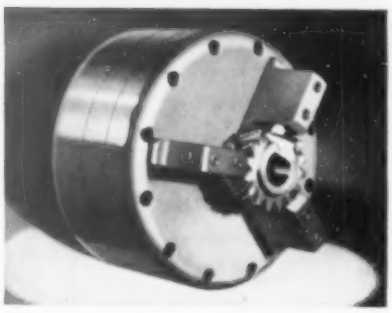
ENGINEERED PRODUCTS

ACCURACY YOU CAN TRUST

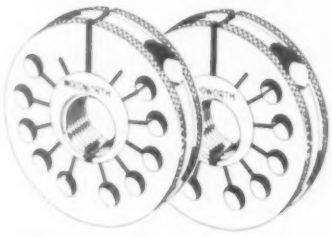
CONE-LOK JIGS

Chucks engineered and built by Woodworth guarantees the ultimate in precision gear chucking.

Woodworth Cone-Lok Jigs are noted for their mechanical simplicity and "life-time" construction.



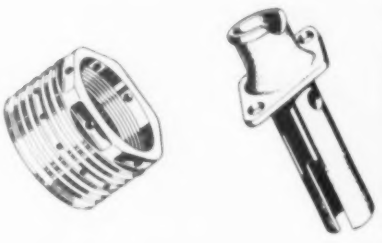
DIAPHRAGM CHUCKS



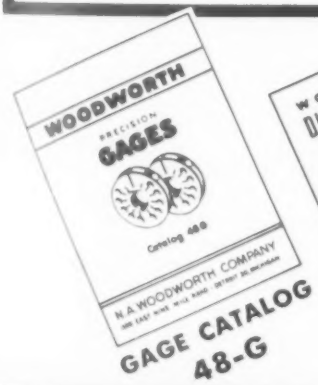
PRECISION GAGES

Woodworth manufactures a complete line of thread ring and thread plug as well as cylindrical plug and ring gages. Also produces special gages to customer blueprints.

N. A. Woodworth engineering gives you plus value in precision parts. Production men with "know-how" combined with well equipped plant are pace setters in aircraft engine and radar assembly fields.

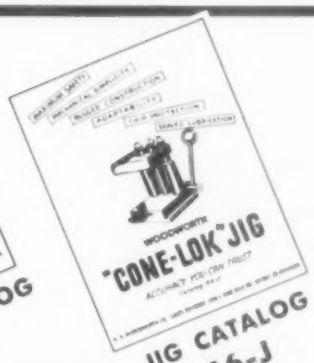


PRECISION PARTS



GAGE CATALOG 48-G

CHUCK CATALOG 49-C



JIG CATALOG 46-J

WRITE FOR LITERATURE

New, comprehensive catalogs on N. A. Woodworth chucks, jigs and gages. Precision parts data supplied upon request for specific information. All inquiries should be on your company letterhead and mailed to address below.

WOODWORTH

N. A. WOODWORTH CO., 1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

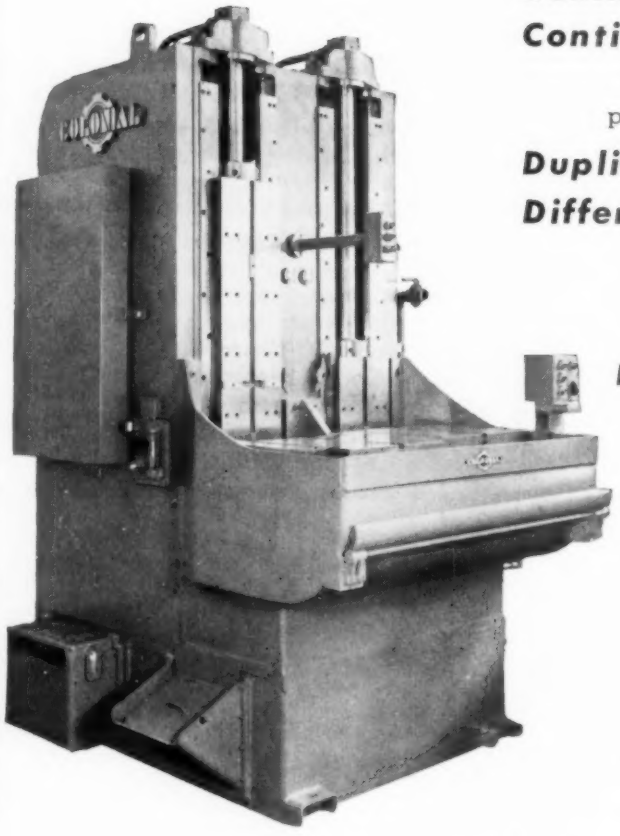
PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOC JIGS • PRECISION PARTS

#1
+#2
+#3
+ ?

Another round of wage Raises?

OFFSET THESE COSTS with machines like these—

New COLONIAL DUAL-RAM Surface Broaching Machines



Continuous loading
Continuous cutting
with the rams
performing either
Duplicate operations, or
Different operations, on
the same or
different parts

Now further improved with

All electric controls

•

Preselective continuous or single cycling

•

Faster set-up

•

Minimum down-time for maintenance

•

Higher capacity

•

and a host of other operating and structural features.

Ask for Bulletin # RT-48

PIONEERS OF H.S.S. BROACHING
COLONIAL
BROACH CO. DETROIT 13

•7200 stainless steel stampings per hour—

•tolerances held within 0.002" —

...using DANLY STANDARD PRECISION DIE SET

Sustained operating precision of die set reduces die wear...produces 200,000 stampings per grind

Inherent accuracy in Danly Die Sets permits taking full advantage of the die maker's precision under actual press operating conditions. As a result, close tolerances may be held and tool life is substantially increased.

In the stamping operation shown, stainless steel parts for electrical instruments are pierced, formed and blanked in an intricate progressive die. Tolerances are extremely close, and finished parts must pass rigid gage inspection.

Stampings are produced at a rate of 120 per minute. At this high speed, a tolerance of 0.002 in. is held on inside and outside diameters and the distance between the bent arms. Danly Die Set accuracy is a major factor in maintaining punch-and-die relation, resulting in production of 200,000 parts between grinds.

DANLY ENGINEERING SERVICE—Use Danly Die Sets to insure the same close precision, high production and long die life on all of your press work. Consult our Engineering Dept. for helpful recommendations on die sets—large or small, standard or special—for *any type* of press operation. (No obligation.)

DANLY NATION-WIDE ★ASSEMBLY SERVICE

Danly offices in 10 key cities give immediate attention to your orders. Assembly plants (marked with stars) stock interchangeable parts for quick delivery of any standard die set to your specifications.

- ★ **Chicago 50,** 2100 S. 52nd Ave.
- ★ **Cleveland 14,** 1550 E. 33rd St.
- ★ **Dayton 2,** 990 E. Monument Ave.
- ★ **Detroit 16,** 1549 Temple Ave.
- ★ **Grand Rapids,** 113 Michigan Ave., N. W.
- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommon Metals & Supply Co., 4890 S. Alameda
- ● **Milwaukee 2,** 111 E. Wisconsin Ave.
- ● **Philadelphia 44,** 18 W. Chelten Ave.
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get this *free* bulletin

Illustrates how Danly Service on special die sets can save you time and money.

DANLY

DANLY MACHINE SPECIALTIES, INC.

2100 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

PRECISION DIE SETS...STANDARD AND SPECIAL | MECHANICAL PRESSES AND PRESS EQUIPMENT

Compressor Blocks Now Finished

20% FASTER, and with HIGHER PRECISION

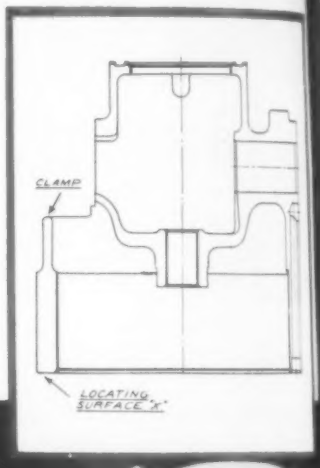
on a new Heald Model 222 Bore-Matic

Here's a typical case where a new Heald machine meant more and better production at lower cost.

With this Heald Model 222 Bore-Matic, a manufacturer of compressor bodies has "upped" production 20%, improved product quality, and increased operator efficiency. Parts are now bored, faced and chamfered, two at a time, in a single automatic machine cycle. Faster indexing for greater cycle speed, constant feed hydraulic control for greater precision, and simplified loading and handling have made these savings possible.

Such results don't "just happen." They are the end product of years of research and engineering to produce a new line of Bore-Matics as well as Internal and Rotary Surface Grinders, which are especially designed for your present-day needs. So, whatever your precision finishing problems, why not get in touch with your nearest Heald representative. His job is to help you do your job better, and at lower cost.

Increased production of compressor blocks is due to a faster operating, easier loading new Heald Model 222 Bore-Matic. Drawing below shows surfaces borized.



HEALD

THE HEALD MACHINE COMPANY

Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton
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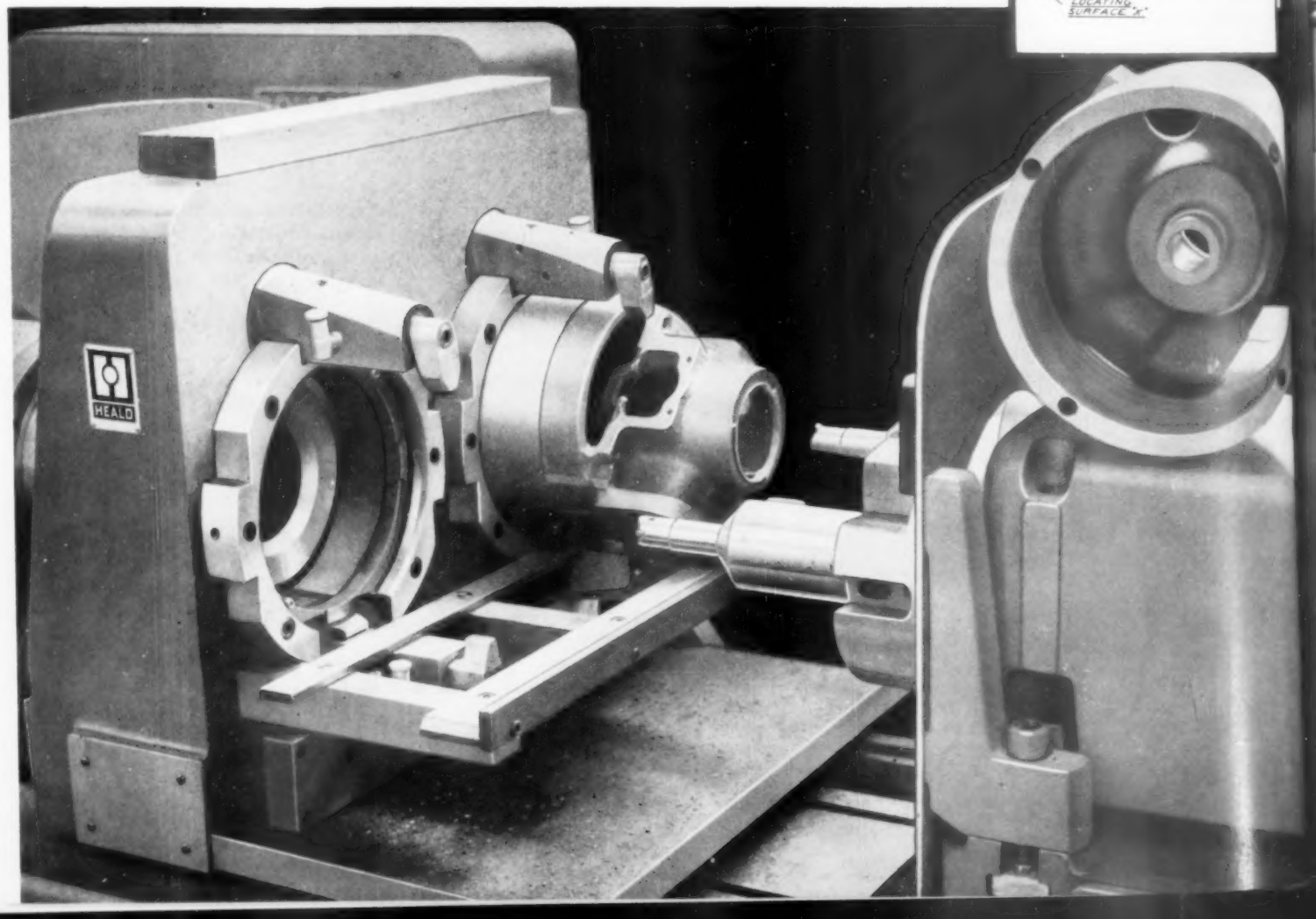
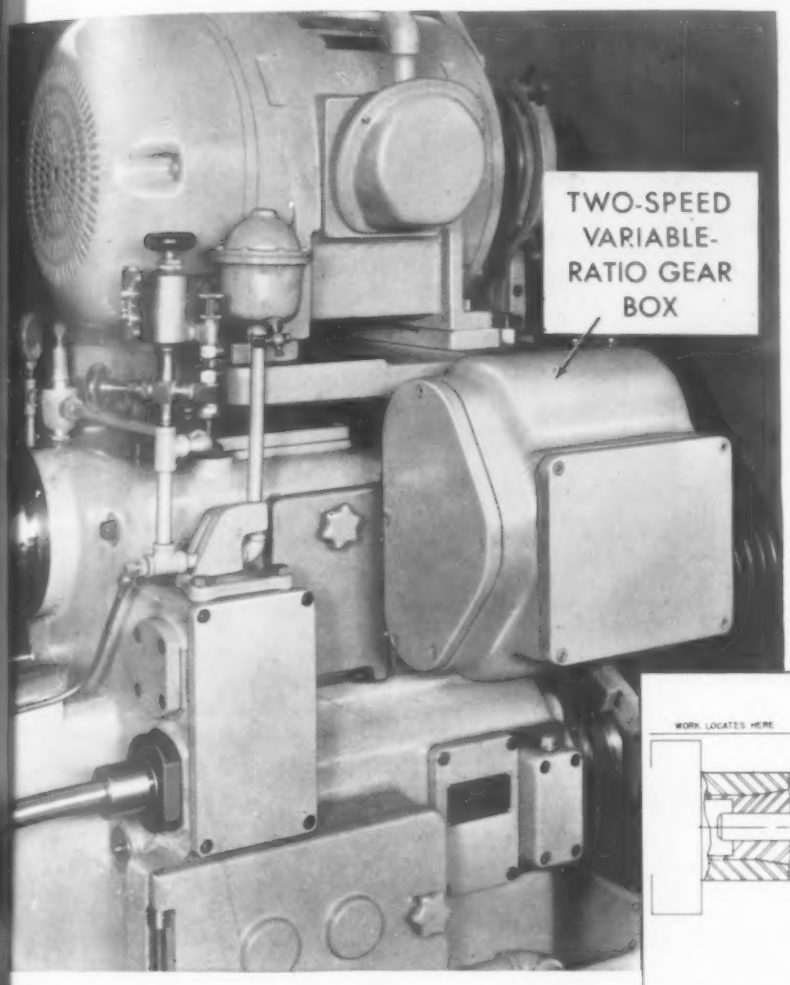


MACHINE OF THE MONTH

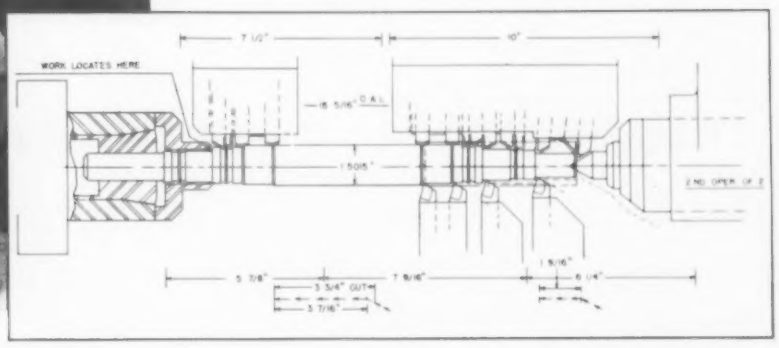
PARED BY THE SENECA FALLS MACHINE CO. **"THE Lo-swing PEOPLE"** SENECA FALLS, NEW YORK



Combined Turning and Squaring Operations at Different Cutting Speeds Now Possible with Lo-swing Automatically Controlled Two-Speed Headstock

Left. View of two-speed, Variable-Ratio Gear Box with Belt Guards removed.

Below. Tooling layout for electric motor shaft.



Problem: To turn, face and undercut shoulders on electric motor shafts, using cemented carbide tools for the turning operations and high speed steel tools for facing, grooving and chamfering operations which require a very smooth finish. Both operations to be made in one handling with automatic spindle speed change between the turning and squaring operations.

Solution: The Model "LR" Automatic Lo-swing Lathe selected for this job was equipped with a Two-Speed, Variable-Ratio, Gear Box shown in the illustration. The speed change from high to low and back to high again in a single machine cycle is controlled by two adjustable cams, mounted on the main cam shaft, which may be set to operate the multiple disc clutch at any time during the machine cycle. The ratio between the high and low speeds may be modified through pick-off gears to suit special conditions without removing or dismantling the gear box.

The tooling layout shows the second of two operations on a 1½" diameter electric motor shaft. The shaft is held and driven, on a previously turned diameter, in an air-operated collet chuck which grips the shaft well in from the end, exposing only the part to be machined. This method reduces the shaft's effective length and eliminates springing due to the rigid grip of the collet. The work is positively located from a previously finished shoulder, insuring accuracy of shoulder lengths.

The shaft diameters are turned with sintered carbide tools mounted on the front carriage, cutting at a surface speed of 350 ft. per minute. The squaring and forming tools are mounted on the rear slide and operate at a surface speed of 70 ft. per minute, insuring a very high polished surface on the shoulders and formed grooves. This combination assures high production, coupled with smoothly finished shoulders, both of which are very desirable on electric motor shafts.

Consult Seneca Falls engineers for assistance in solving your automatic turning problems.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

PRODUCTION COSTS ARE LOWER WITH Lo-swing

NOW GRIND RELIEF on SPIRAL-FLUTED TOOLS

FAST—EASY—ACCURATE

The Circularity-Grinding Attachment easily and accurately produces form, radial or form and radial relief together on any length of spiral flute . . . on straight or tapered tools. Amount of relief and spiral is set up by scales on attachment and every tool has identical relief from same set-up.

No special fixtures required for any tool and attachment fits any cylindrical or cutter grinder. Work held between centers or in chuck. When not grinding relief, attachment operates as motor driven headstock for grinding straight and tapered cylindrical work.

SEND FOR BULLETIN

DETROIT REAMER & TOOL CO.

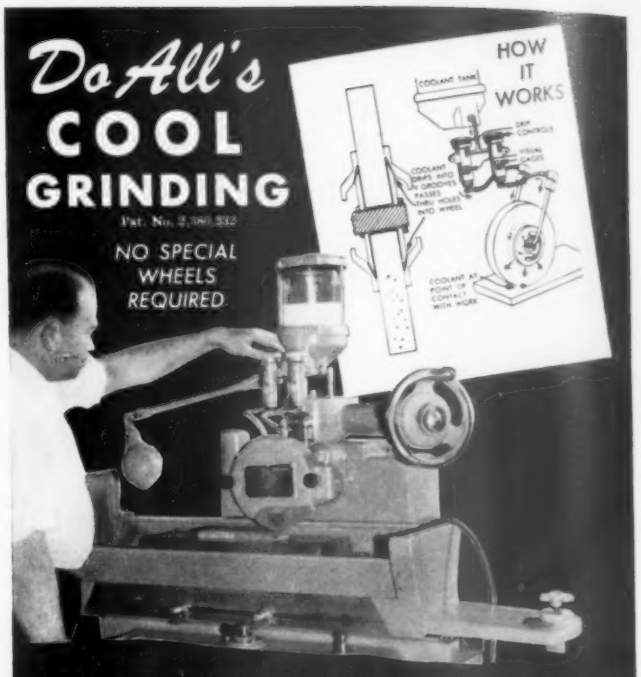
Mfrs. of Special High Speed Cutting Tools

2830 East 7 Mile Rd. Detroit 12, Michigan

DoAll's COOL GRINDING

Pat. No. 2,580,532

NO SPECIAL WHEELS REQUIRED



DoALL's exclusive *Cool Grinding Unit* on precision surface grinders produces better finish, requires fewer wheel dressings and assures longer wheel life. Keeps the work as cool as any coolant and gives better work visibility. Eliminates the need of coolant pumps and dust collectors for most work. Minimizes cracking, skin softness and warping. Secret of this new process is that coolant passes right through the wheel—fed into wheel near center and drawn to edge by centrifugal force as shown in above drawing. DoALL Precision Surface Grinders—6 models—are hydraulically operated. Write for data.

The **DoALL Co.** DES PLAINES, ILL.

INCREASED PRODUCTION ★ BETTER WORK

with

Boyar-Schultz Screw Machine Tools

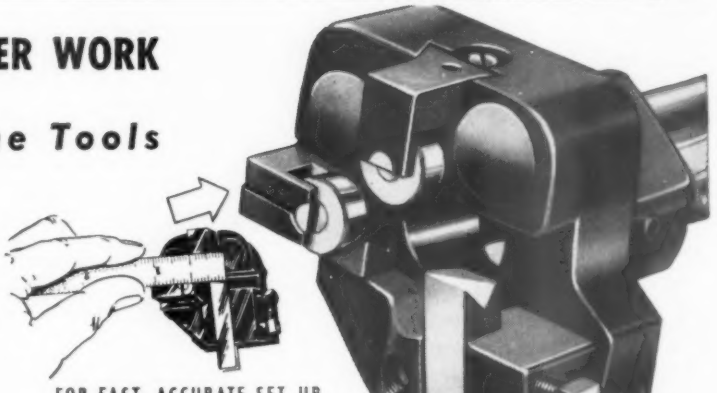
A Turning Tool with outstanding features that increase quality production and reduce down time and rejections to a minimum.

Precision made from the finest steels, it is designed for very close tolerance work and made with the built-in strength to hold adjustments accurately through long runs.

An extremely easy tool to set up and adjust. After regrinding, the tool bit can be returned to holder in the same exact position with minimum lost time. The result—less down time.

Available in 6 sizes, 000 to 3.

WRITE FOR NEW SCREW MACHINE TOOL CATALOG.

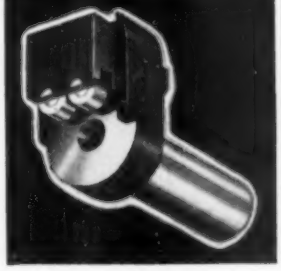


FOR FAST, ACCURATE SET-UP
Straight-edge placed on milled step of left roller block marks correct center line position for cutting land edge of tool bit.

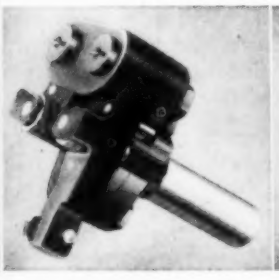
Tool steel can be removed from tool bit holder, sharpened and returned to holder in the correct position with a minimum of down time

MODEL T TURNING TOOL

NEW! MODEL RR Roller Rest



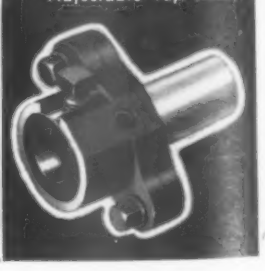
Model K Knurling Tool In Three Sizes, 00, 0 & 2



Model DRH Adjustable Drill and Reamer Holder In Three Sizes

Model C Burnishing Tool Made In Three Sizes 00, 0 & 2

NEW! MODEL AT Non-Releasing Adjustable Top Holder



BOYAR-SCHULTZ CORPORATION **2104 WALNUT ST., CHICAGO 12**

New

BESLY

Double Vertical Spindle GRINDER

PRECISION GRINDS SMALL PARTS

faster . . . at lower cost

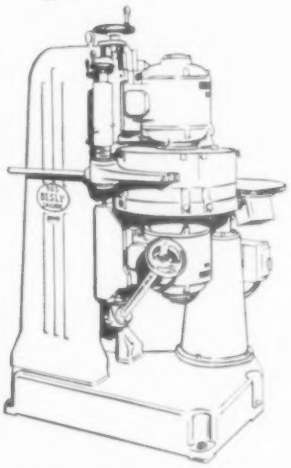
High speed production on close tolerance small parts grinding is easily achieved with this versatile No. 905 Besly. It's a proved design with new and unique features that speed up output. Grinds wet or dry—*as fast as it can be loaded:* 2400 pieces per hour manually, 5000 or more with feeder attachment depending on material and area to be ground.

In addition to coil spring ends, carbon brushes, ceramics and plastics, the "905" handles a large variety of small steel, aluminum, copper, brass, gray iron and other parts — *fed manually, by magazine or by hopper.*

The "905" may answer your many problems of stabilizing production costs. Why not discuss the possibilities with a Besly engineer?

TITAN WHEELS

Write for this free booklet which offers helpful facts on abrasive wheels . . . It contains valuable data on grinding wheels and abrasives. Learn how Besly-Titan Steelbacs cut "down time" and boost output.



- *Quickly Convertible* from one job to another by easy replacement of one feed wheel.
- *Faster Loading* is attained by horizontal feed wheel. Unloads automatically by gravity.
- *Designed Especially* for small parts grinding — four times as fast as previous methods.
- • *Saves Money:* supplies the need for an intermediate size machine.

SPECIFICATIONS

Double vertical spindle type. May be equipped to grind wet or dry. Choice of 15", 16" or 18" diameter abrasive discs. Motors: 3 H.P., 1750 RPM. Overall length: 41⅞". Overall width: 41⅞". Height: 66".

Maybe GRINDING is the Better Way . . .

Better Check with

BESLY

BESLY GRINDERS AND ACCESSORIES
BESLY TAPS • BESLY TITAN ABRASIVE WHEELS

CHARLES H. BESLY & COMPANY • 118-124 North Clinton Street, Chicago 6, Illinois

Factory: Beloit, Wisconsin

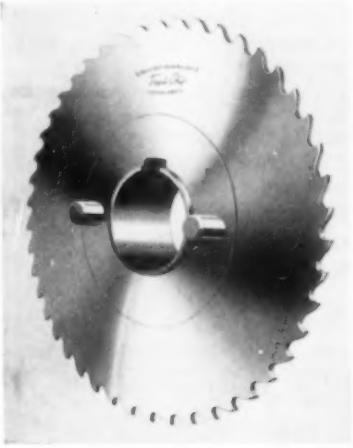
More POWER to your Blades!

Motch & Merryweather Triple-Chip SLITTING SAWS and DUAL DRIVE ADAPTORS insure more profitable slotting production.

Triple-Chip METHOD

• MORE POWER • HIGHER PRODUCTION • LOWER COSTS • LESS BREAKAGE

Motch & Merryweather Slitting Saws have an exclusive dual drive feature through which balanced power is transmitted, eliminating the stresses which cause breakage. A broad, flat hub affords plenty of surface contact for rigid holding, which balks tooth weaving tendencies. Accurate slotting results. Our exclusive Triple-Chip tooth form breaks up and distributes the cutting load, permitting heavier feeds. Deep gullets increase blade strength and produce curling, self-ejecting chips (no clogging). You need fewer blades, since M. & M.'s exclusive adaptors fit many arbor sizes. Three standard tooth spacings in every diameter and thickness aid the cutting of thick or thin sections.



M. & M.'s exclusive dual drive delivers more power to the blade without danger to the driving means. Ample side clearance is ground into the blade down to the broad hub. Standard dual drive adaptors are designed with ample keyway to more than satisfy tough cutting requirements.

Write for our Bulletin "T-2"

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING • CLEVELAND 13, OHIO

CUTTING TOOL DIVISION

AT YOUR COMMAND • AN UNPARALLELED EXPERIENCE IN CIRCULAR SAWIN

THOUSANDS OF MANUFACTURERS KNOW FROM EXPERIENCE

nothing can cut costs like WALES

HOLE PUNCHING AND NOTCHING EQUIPMENT

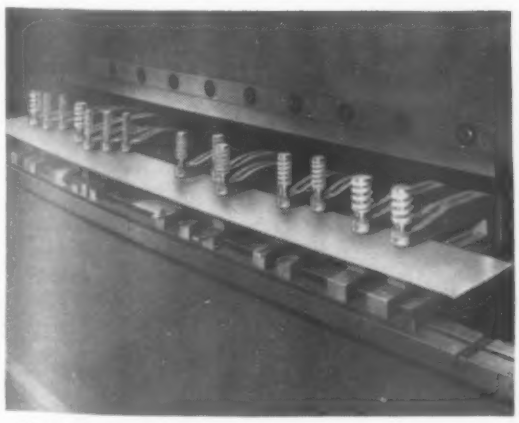
Here's an example.... The case history of Wales Equipment with the Butler Manufacturing Company started by a Wales Service Engineer call. The result of this and subsequent calls, Butler has standardized on Wales Equipment for punching bolt holes in parts of their metal pre-fabricated buildings. In the advertisement at left, Butler stresses the point of LOWER COSTS. Wales Equipment with exclusive time-saving, money-saving features contributed to these LOWER COSTS.

IT'S TOO BIG A STORY TO TELL ON THIS PAGE. AS A SUGGESTION, however, before deciding on the hole punching and notching portion of your tooling program, check with Wales-Strippit engineers who may solve your particular hole punching and notching problems by using STANDARD adaptations of STANDARD Wales Equipment. Join the large group of leading manufacturers who have made it a rule to call on Wales-Strippit before putting holes and notches in angles, channels, extrusions and sheets by any method. *Write for Catalog CJ.*

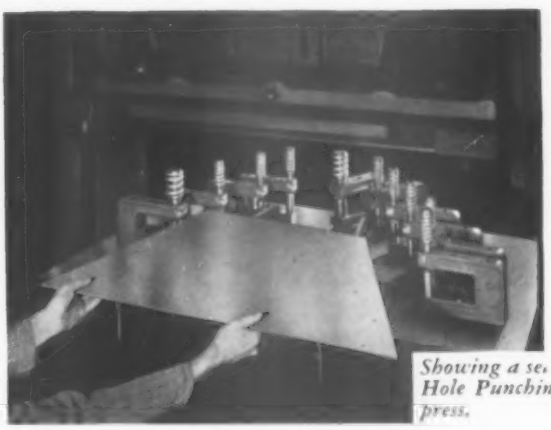
Bolted Construction
Means
Greater Strength
Greater Rigidity
Lower Cost
in BUTLER BUILT
STEEL • ALUMINUM BUILDINGS
First Rigid Frame Truss-Clear Design To Be Mass-Produced
Secure, strong fastening of metal to metal is best accomplished with bolts. That's why Butler buildings rely solely on bolts (inserted, not driven, through precision-punched holes) to hold aluminum sheets together and to hold these sheets securely to the steel building frame. There is no rupture or tearing of sheets—there are no loose rattling sheets to leak and reduce the service life of buildings and increase costs of upkeep.
3 ADAPTABLE SIZES. 40 ft. width, length in any multiple of 20 ft. Also, 20 ft. and 32 ft. widths, lengths any multiple of 12 ft.
60 ft. width available in Bowstring Truss type.
Check These Other Butler Features
• Full Space Use. Truss-clear, straight sidewalls.
• Special deeply corrugated aluminum sheets.
• Width, Length, Height Variable.
CONTACT YOUR NEAREST BUTLER BUILDING DISTRIBUTOR
BUTLER MANUFACTURING COMPANY
One-Piece Roof
as Advertised in "TIME"

WALES-STRIPPIT CORPORATION
George F. Wales, President
393 PAYNE AVENUE, NORTH TONAWANDA, N. Y.
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment



Showing a typical setup of Wales Type "CJ" Hole Punching Units in a press brake similar to those used by Butler Manufacturing Company.



Showing a setup of Wales Type "CJ" Hole Punching Units in a stamping press.

Behind every manufactured product
is the tool engineer
Behind every tool engineer
is Milne Tool Steel

A. MILNE & CO.
(ESTABLISHED 1887)

➔ **The Tool Engineer wants quality and dependability in the product he uses. He also wants prompt service.**

A. Milne & Co. has had over *sixty years* of experience in furnishing quality steels to American Manufacturers.

These years of service mean quality and dependability.

Our *Seven* Warehouses and *Six* additional sales offices means Service.

Our new Sectional Catalog just published gives valuable technical information on the selection of the proper steel for the particular job. Please write for your copy.

Warehouses located in—New York, Boston, Chicago, Pittsburgh, Philadelphia, Cleveland & New Britain, Conn.

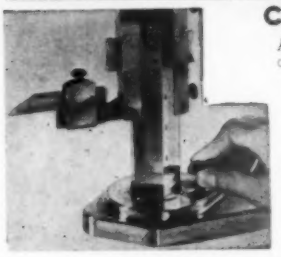
Sales Offices located in—St. Louis, Bridgeport, Springfield, Mass., Dayton, Rochester, N. Y.

Pacific Coast Headquarters—San Francisco.

For the Pacific Northwest—Pacific Machinery & Tool Steel Co., 630 S.E. Belmont Street, Portland 14, Oregon.

America's Leading Tool Steel Specialists

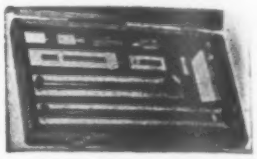
SCHERR *aids to precision*



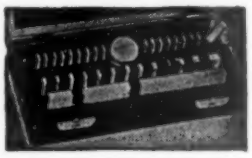
CHESTERMAN HEIGHT GAGE

A big, sturdy stabilized instrument. Fine adjustment by screw operated from knurled nut on base (see photo) eliminates rocking or shifting instrument while measuring. Finger pressure on two lugs frees split nut for rapid vertical adjustment of head. 2½" long vernier in place of the normal ⅝" vernier provides greater visibility without the need of magnifier or removing gage from work. Both English and metric readings one on each face of column. In sizes from 12" to 48" —capacities sufficient for the most unusual measurements.

GAGE BLOCK UTILITY SET



Quick adjustable type holders. Greatly expands the usefulness of any set of standard gage blocks. The complete set includes four holders—2", 4", 8" and 12", two jaws each for inside and outside measurements, a 60 deg. center point, a scriber point, and a substantial height gage base. Holders have no long projecting screws to make handling awkward. Every shop can profitably use one or more of these economically-priced sets, which will save their cost many times over by applying gage block accuracy at first hand, allowing for no variation through the use of any other tool. Any parts of this set can be furnished separately at moderate cost. Set, $98.50.



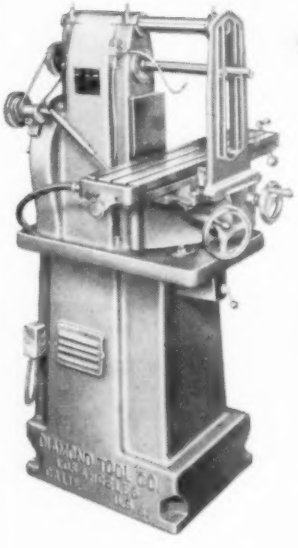
ULTRA-CHEX GAGE BLOCKS

Sets in size for all budgets. All blocks accurate to five millionths. Illustrated is the 34-block set, giving 80,000 combinations in steps of 1/10,000", with optical flat for checking wear. Low prices allow for constant shop use in setting tools, checking gages, etc. Many shops use a number of sets, with one master set for reference.

WRITE FOR FULL DETAILS ON THE ABOVE TOOLS, AND FOR THE SCHERR SMALL TOOL CATALOG.

GEO. SCHERR CO., Inc. 199-A LAFAYETTE STREET NEW YORK 12, N. Y.

DIAMOND
MILLING MACHINES



➔ **MODEL M-30**

...*New* SILENT CHAIN DRIVE assures positive cutter rotation even at slowest spindle speeds!

Write FOR COMPLETE CATALOG

DIAMOND MACHINE TOOL COMPANY
3427 EAST OLYMPIC BLVD., LOS ANGELES 23, CALIF.
OFFICE AND WAREHOUSE IN CHICAGO

Hanna Rapid Riveters

...RIVETING AT GREATER SPEED BECAUSE THEY ARE TOOLED TO DO YOUR JOB!

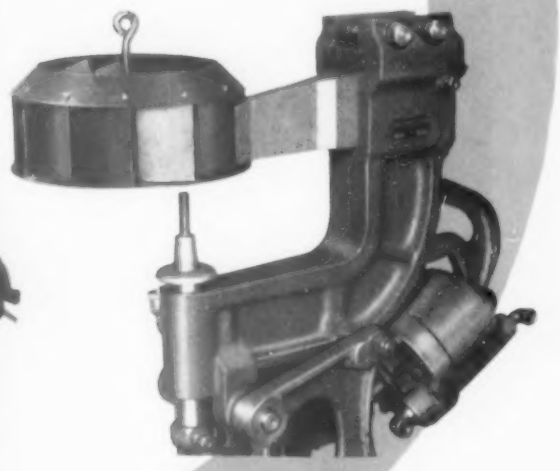
They are called "Rapid Riveters" for two good reasons.

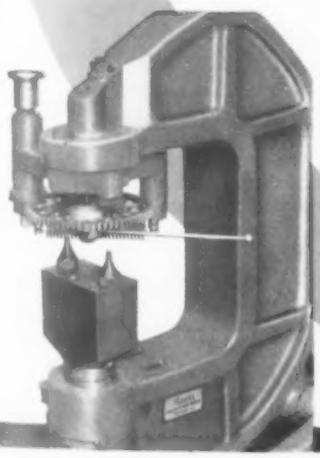
- **their speed in setting a tight rivet in one stroke . . . and**
- **their adaptability to simple tooling that make them production units for *your special job*.**

Hundreds of them are driving rivets rapidly in plants that fabricate everything from Agricultural Implements to Automotive Assemblies — plants that need the most dependable riveting at top production and lowest cost.

Hanna Rapid Riveters are available in a broad capacity-range from 6 to 20 tons, capable of driving $\frac{3}{16}$" to $\frac{3}{8}$" rivets *cold*. If your products are in that range your riveter should be a Hanna Rapid.

To give you specific "reasons why" let us furnish the details for comparison with your present fabricating technique. Just send blue prints of the parts, production desired and other pertinent facts — a sample assembly should be sent, too, if practical. No obligation on your part.





Write for this new Hanna Rapid Riveter Bulletin No. 246. Tells all about the "Rapid."

Hanna Engineering Works

HYDRAULIC AND PNEUMATIC EQUIPMENT . . . CYLINDERS . . . VALVES . . . RIVETERS

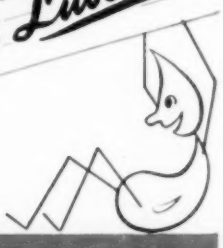
1765 Elston Avenue, Chicago 22, Illinois

① CASE HISTORY

MACHINE	OPERATION	MATERIAL
Blanchard Rotary Grinder	Finish grind	HSS Die Block

COMPARISON	OTHER COOLANTS	LUSOL
	Feed .004" Wheel dressing every hour with .008" removal. Motor load 45 amps.	Feed .012" Wheel dressed every 8 hours with .0065" removal. Motor load 30 amps.

Saved 7 wheel dressings, decreased motor load 15 amps. with Lusol



ARE YOUR IDEAS ON CUTTING FLUIDS

OUT OF DATE?

Cutting fluids that once helped your machines set production records may now prevent your shop from meeting demands for increased production and lower costs. Modern machine tools can operate at feeds and speeds formerly impossible... but they require a cutting fluid that keeps work, chips and tools cool to permit maximum tool life, accurately finished work.

That's why more and more production men specify Lusol, a true solution that withdraws heat rapidly . . . permits higher speeds, closer tolerances, fewer rejects, less down time.

Send for test sample today.

F. E. ANDERSON OIL COMPANY
PORTLAND, CONNECTICUT
RUST PREVENTIVES • SPECIAL INDUSTRIAL FLUIDS • CLEANERS

Distributors in: Syracuse, Cleveland, Toledo, Detroit, Chicago, Milwaukee, Louisville, Philadelphia, Dallas, Houston, Los Angeles, Denver, Tulsa
1AN49

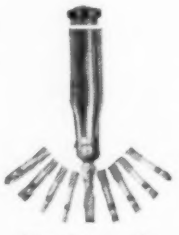
SPEEDS ASSEMBLY...

UNBRAKO
Reg. U. S. Pat. Off.

KNURLED SOCKET HEAD CAP SCREW

The head of the ubiquitous "Unbrako" Socket Head Cap Screw is KNURLED to speed assembly. The KNURLS "gear" right to the fingers—the handiest of wrenches—no matter how oily, and a positive slip-proof grip is the result—**no futile motion.** Of course, the Internal Wrenching feature provides cost savings in material, weight and space. Sizes from #4 to 1½" diameter, in a full range of lengths.

Knurling of Socket Screws originated with "Unbrako" in 1934.



Kits: pat. pend.

You can't tighten or loosen socket screws without a hex socket wrench, so why not use our #25 or #50 "Hallowell" Key Kit, whose Hollow Handle contains most all hex-socket bits.

Write us for the name and address of your nearest "Unbrako" Industrial Distributor and for your copy of the "Unbrako" Catalog.

Over 46 Years in Business

STANDARD PRESSED STEEL CO.
JENKINTOWN, PENNSYLVANIA, BOX 786
• Chicago • Detroit • St. Louis • San Francisco

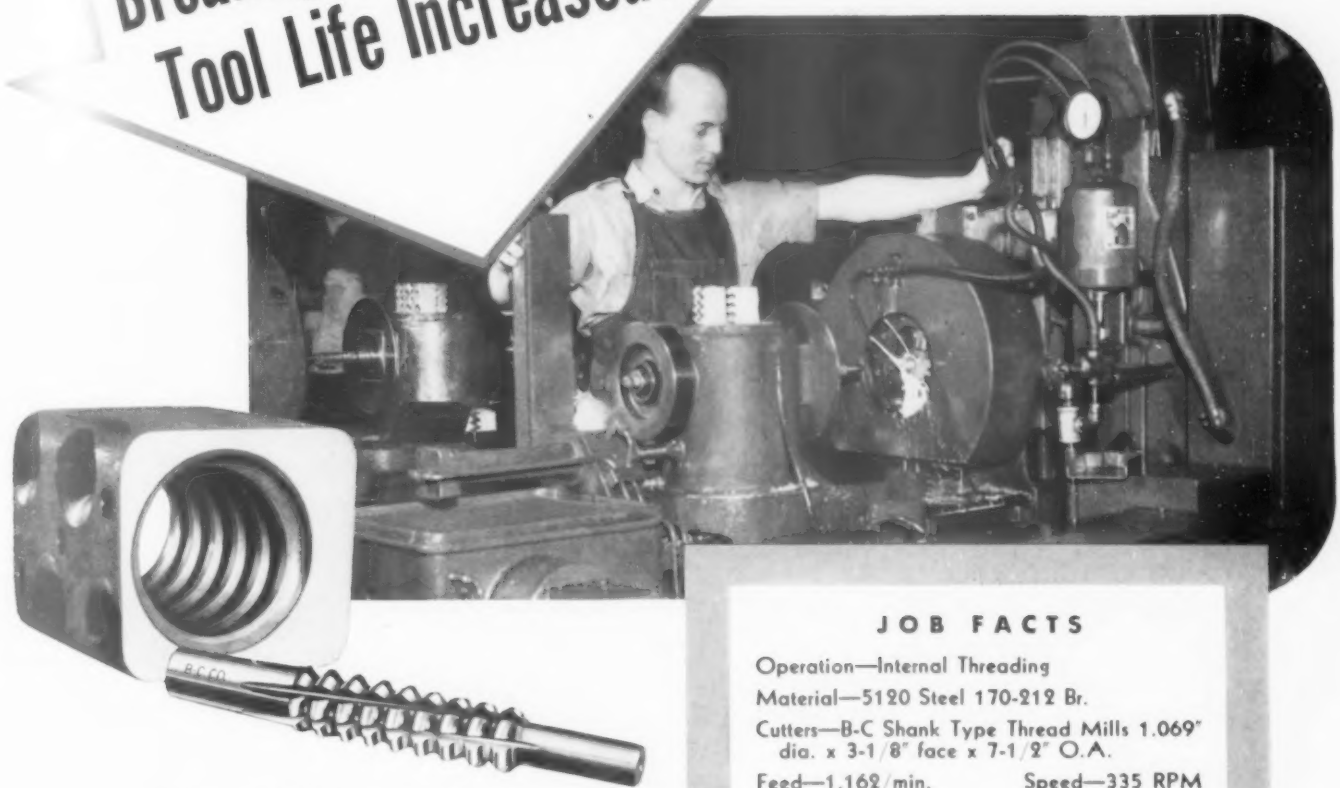
THE *Helping Hand* IN Precision Hardness Testing

• WILSON has maintained and continues to maintain Field Service Engineers who are hardness testing specialists. Their responsibility is to (*1*) study users' requirements, (*2*) recommend equipment that will serve best, (*3*) see that it is correctly installed and (*4*) that it *continues* to give dependable service.

We are originators, exclusive makers of "ROCKWELL" Hardness Testers, "ROCKWELL" Superficial and TUKON Microhardness Testers. Our years of developing and improving hardness testing equipment give our factory-trained representatives background for best possible service to you.

WILSON
MECHANICAL INSTRUMENT CO., INC.
AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.
230-H PARK AVENUE, NEW YORK 17, N. Y.

Breakage Eliminated! Tool Life Increased!



With **BARBER-COLMAN**
JOB-ENGINEERED FORM CUTTERS

JOB FACTS

Operation—Internal Threading
Material—5120 Steel 170-212 Br.
Cutters—B-C Shank Type Thread Mills 1.069" dia. x 3-1/8" face x 7-1/2" O.A.
Feed—1.162/min. Speed—335 RPM
Cutting Time—.56 min.
Tool Life—350 pces./sharp.
10,500 pces./cutter

More production with less tool cost is the record on this job. Small diameter internal threads with special form require a tool with a long cutting face, capable of removing a large amount of metal at high speed. The heavy chip load causes vibration which, on conventional type unsupported thread cutters, results in frequent breakage and poor tool life.

Barber-Colman cutter engineers designed a special tool with extra clearances and an outboard pilot support to steady the cutting action. Now cutting time has been reduced to .56 minutes per piece and tool life has reached the remarkable level of 10,500 pieces per cutter.

Cutting tools built to fit the specifications of the job always pay off in lower tool costs and lower production costs. That's why we'd like to show you what Barber-Colman Job-Engineered Cutters will do on your next job.

METHODS ENGINEERS!

Get this file of typical performance on standard and special cutting tools. Just send a request on your company letterhead asking for Milling Cutter Data No. 447.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 447 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

BARBER COLMAN

UNIVERSAL

marches at the head of the drill bushing parade!

super finish reduces wear to a minimum

blended radius banishes tool hang-up

100% hardness and concentricity tests assure accuracy

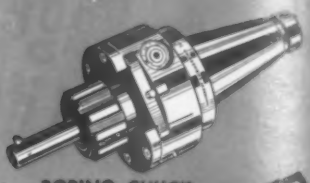
knurled head provides quick sure grip

ample stocks in 3 warehouses assure immediate delivery

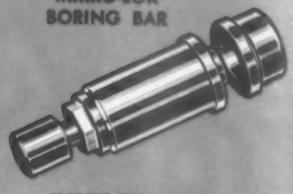
The main office at Frankenmuth, Michigan, and Universal warehouses at 89 Main St., Ansonia, Conn., and 5035 Sixth Ave., Kenosha, Wisc., offer prompt delivery.

UNIVERSAL ENGINEERING COMPANY
FRANKENMUTH 3, MICHIGAN

OTHER UNIVERSAL PRODUCTION TOOLS

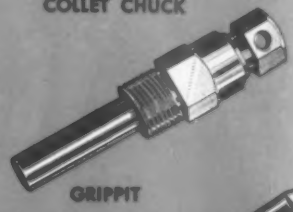

BORING CHUCK

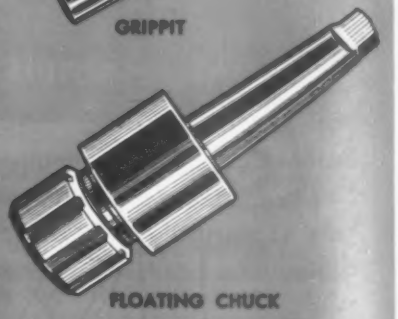
MIKRO-LOK BORING BAR

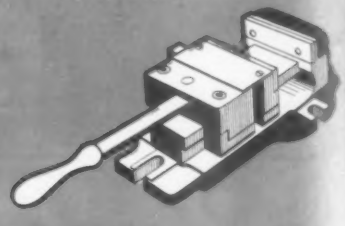

INDEX PLUNGER

STANDARD DRILL BUSHING

STANDARD COLLET CHUCK


GRIPPIT


FLOATING CHUCK


WEDGE-LOCK PRODUCTION VISE

Facilities Available for Special Hardened and Ground Precision Parts Made to Customer Specifications

THE GREENFIELD STORY
of Service and Quality

"Built-In"

THE tap is not a tool whose value can be told by its looks. It is only in its performance that its merit becomes manifest. If it threads thousands of holes at high speeds with undeviating accuracy, it is a good tap. Its true value is built into it by the maker in his selection of steel, his workmanship, and his refinements of design that are rarely visible to the eye. There is, we believe, still another important "built-in" value in "Greenfield" taps. It is the service which is available to the tap user from the distinguished list of distributors who stock the "Greenfield" line from coast to coast; and the on-the-spot help which is available from the trained "Greenfield Man" on any threading problem at any time. *Such "built-in" values are an important chapter in the "Greenfield" story of service and quality.*

GTD

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

and

GEO MET RIC

THE GEOMETRIC TOOL CO.
New Haven 15, Connecticut

and

GTD AMPCO

AMPCO TWIST DRILL CORP.
Jackson, Michigan

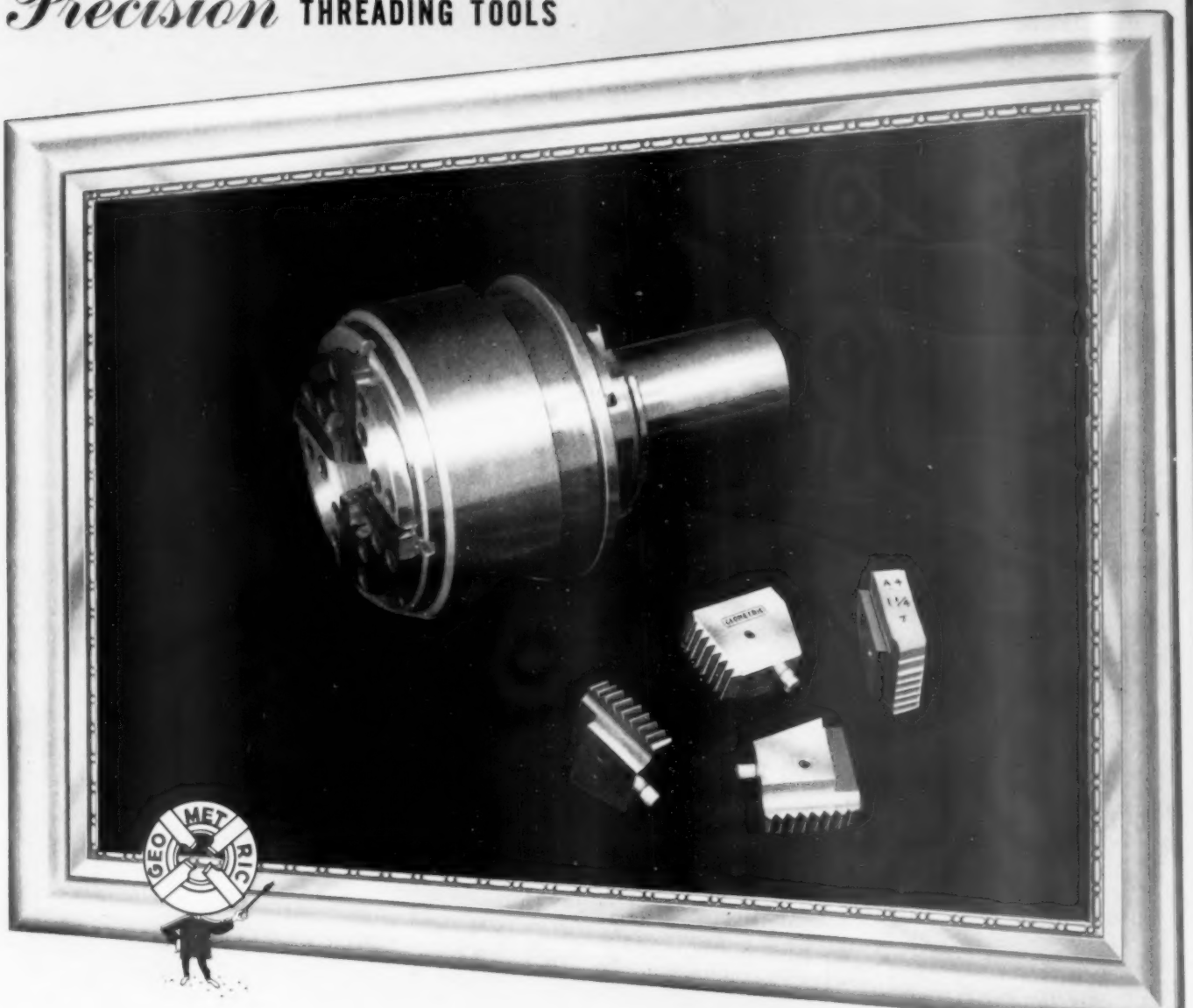
Divisions of Greenfield Tap and Die Corporation

GTD

GREENFIELD

Be Sure
Buy "Greenfield"

Precision **THREADING TOOLS**



Rotary Style KD Die Head and Chasers

This Self Opening Die Head is for use on live spindle machines, particularly automatic screw machines.

★ ★

Available in six sizes, with a cutting range from 1/16" to 2½".

★ ★

GEOMETRIC also makes a complete line of Self Opening, Stationary and Solid Adjustable Die Heads — and Collapsing and Solid Adjustable Taps. *Write today for further details.*

"Be Sure . . . Buy Geometric"

THE
GEOMETRIC
TOOL COMPANY, NEW HAVEN 15, CONNECTICUT
Division of Greenfield Tap and Die Corporation

GTD GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

GTD AMPCO TWIST DRILL CORPORATION
Jackson, Michigan
Division of Greenfield Tap and Die Corporation

THEY MAY LOOK ALIKE . . . *but there's a difference!*

Mark of Antonius Stradivarius, Cremona, Italy . . . 1719

Mark of distinctive workmanship and quality

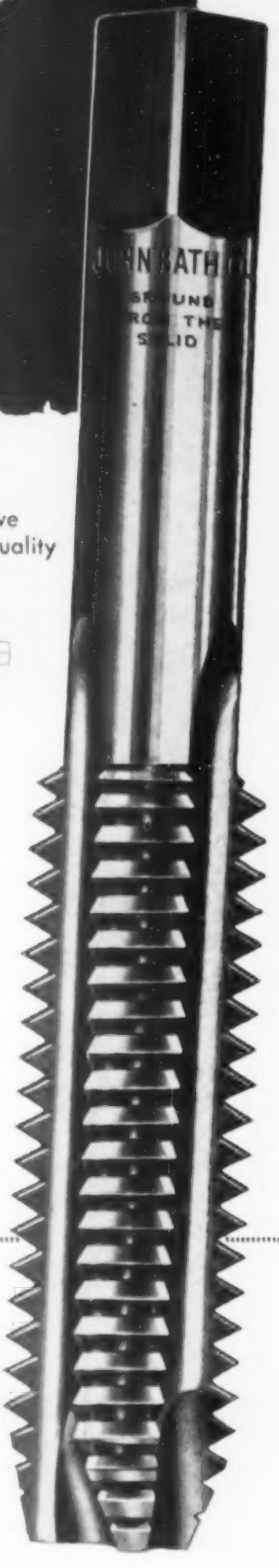
While both violins may look alike to the camera's eye, one is a rare instrument . . the other, a clever copy Actual comparison by a trained musician will show a vast difference in quality and value!

THERE IS A DIFFERENCE IN TAPS, TOO!

All taps may look alike at first glance, but the inherent, built-in quality of BATH ground thread taps is evident by their outstanding, every-day performance. Bath taps are ground from the solid AFTER hardening . . . are available in stock sizes or custom built for special uses.

For instance, if you're having trouble tapping stainless steel, there's a BATH tap, especially ground and engineered to speed production and decrease the threading cost of this hard-to-work metal. Why not investigate this special tap . . . or, write us about your particular threading problem today? Our experience is yours for the asking!

INSIST ON BATH TAPS . . PROFIT BY THEIR PLUS-PERFORMANCE!



PLUG AND RING THREAD GAGES · GROUND THREAD TAPS · INTERNAL MICROMETERS

JOHN BATH CO. INCORPORATED

20 Grafton St., Worcester, Mass.

28 Grafton St., Worcester, Mass.

Does INSPECTION

cost you money

OR

save you money?

Old-fashioned methods of dimensional inspection definitely increase your costs—because they find errors only *after* the scrap and rework are made. An inspection system should catch the errors *before they happen!*

Visible gaging—Dial Indicator Gaging — offers major advantages over old-fashioned *feel-your-way* methods. The Dial Indicator gives you the reading at a glance. Human error is minimized; the sense of sight is more dependable than the sense of feel. Moreover, if the workpiece is off-size, the Dial Indicator tells you exactly which way and exactly how much. This means greater salvage, less scrap.

This photograph shows an application of the Dial Indicator to the gaging of inside hole diameters. There are no blind spots for this gage; it tells you the exact dimension—in .0001"—*and every variation.* These gages are available in both portable and bench models—to inspect holes ranging from .122" to 12.665" in diameter.

We make both regular and custom-built gages to meet the needs of users in a hundred industries. For highly specialized needs, we also make Air Gages and Automatic Electronic Sorting Gages . . . Important applications of these two types of gages are shown on the opposite page.

COLOR FILMS AVAILABLE—LOANED ON REQUEST

(1) "The Dial Indicator" } on one large reel
(2) "Dial Indicator Gages" }

Showing fundamentals and uses

FEDERAL

FEDERAL PRODUCTS COPORATION

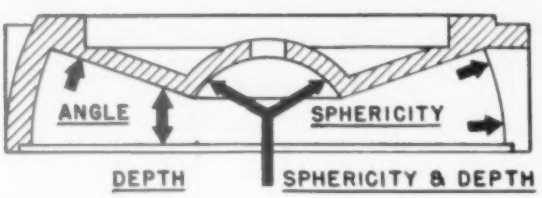
YOUR PROFIT DECISION IS *Visible** PRECISION

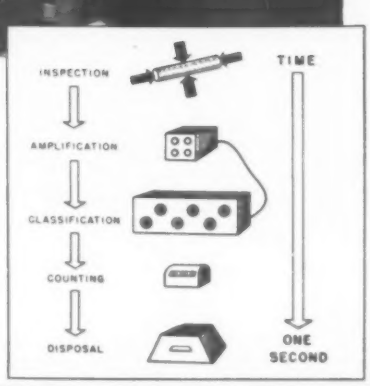
***The use of Dial Indicator Gages — visible precision — lowers inspection costs, raises production. Federal Products Corporation is America's largest maker of both regular and custom-built gages — mechanical, air, electronic — for the measurement of single and multiple dimensions.**

AIR GAGE INSPECTS
involved dimensions in liquid meter chamber

This Gage illustrates the exceptional possibilities of gaging involved dimensions simultaneously by air. It checks the internal side wall for sphericity and the conical section for angularity and depth. Simultaneously the concentricity of these three surfaces is checked relative to each other. The Dial Indicator checks the depth of the ball seat. Another Gage, used in conjunction, checks the sphericity of the ball seat when the two halves of the chamber are assembled. Such intricate gaging becomes simple with a Federal Air Gage.

Courtesy of Worthington-Gamon Meter Co. (subsidiary of Worthington Pump and Machinery Corp.)





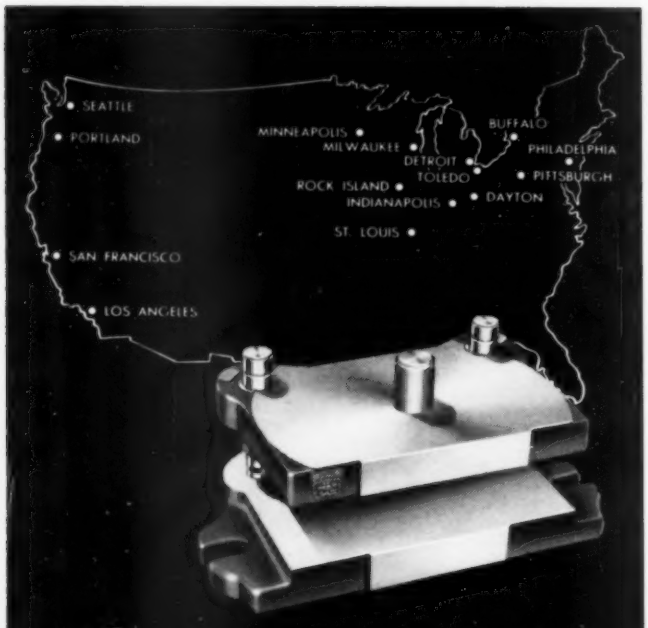
ELECTRONIC GAGE
sorts pen barrels for length and diameter

This Electronic Sorting Gage segregates 3600 pen barrels per hour into eight size categories—for Esterbrook Pen Company of Camden, N. J.—*three times faster* than by previous methods. Barrels too short and too long are rejected first. Those O.K. for length are then sorted into four acceptable diameter groups each having spread of .002". Over and undersized diameters are rejected. Automatic counters keep tally of number of parts per category. Gage shuts off when count in any group reaches 1000.

Write for illustrated Bulletin **19** to receive detailed descriptions of the above gages. Let us help you with any problem of gaging and inspection. If you will send us blueprints of work to be measured, we will gladly recommend the proper gage. No obligation is involved.

FEDERAL PRODUCTS CORPORATION **1144 Eddy St., Providence 1, R. I.**

Represented in Canada by RUDEL MACHINERY COMPANY, LTD.



Representation throughout Industrial America

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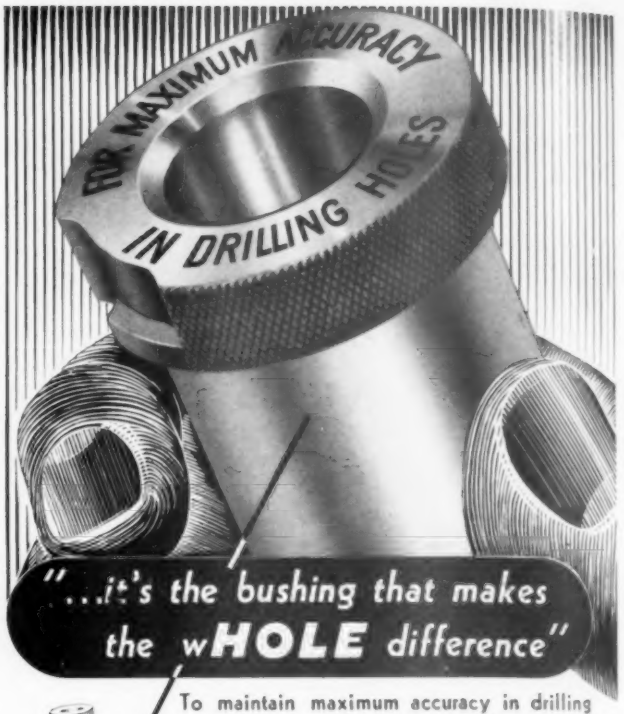

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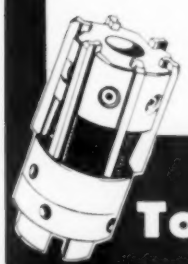

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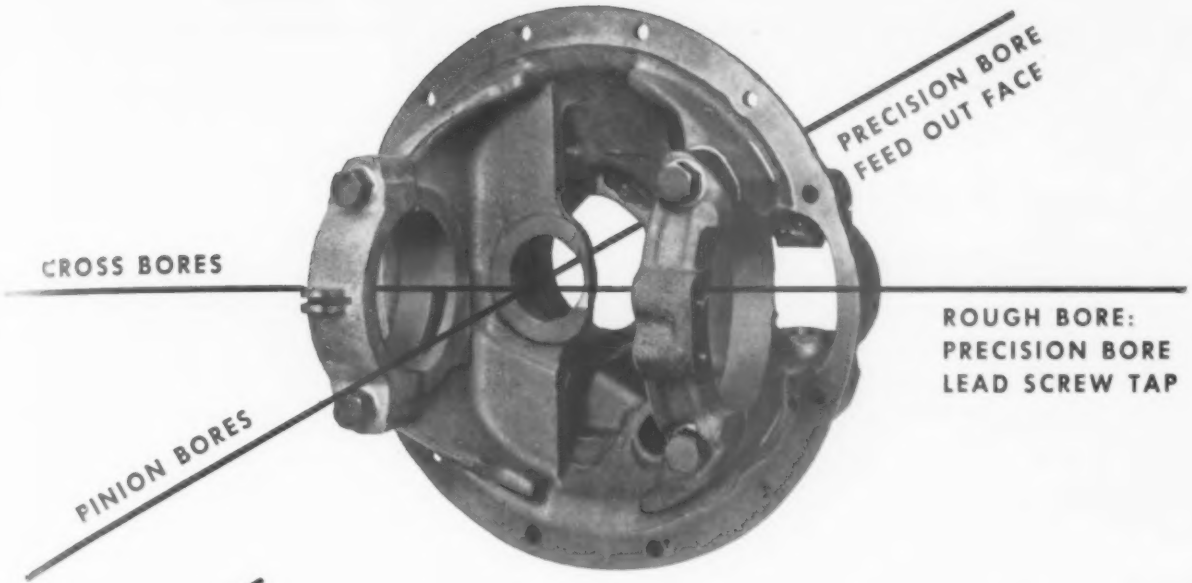

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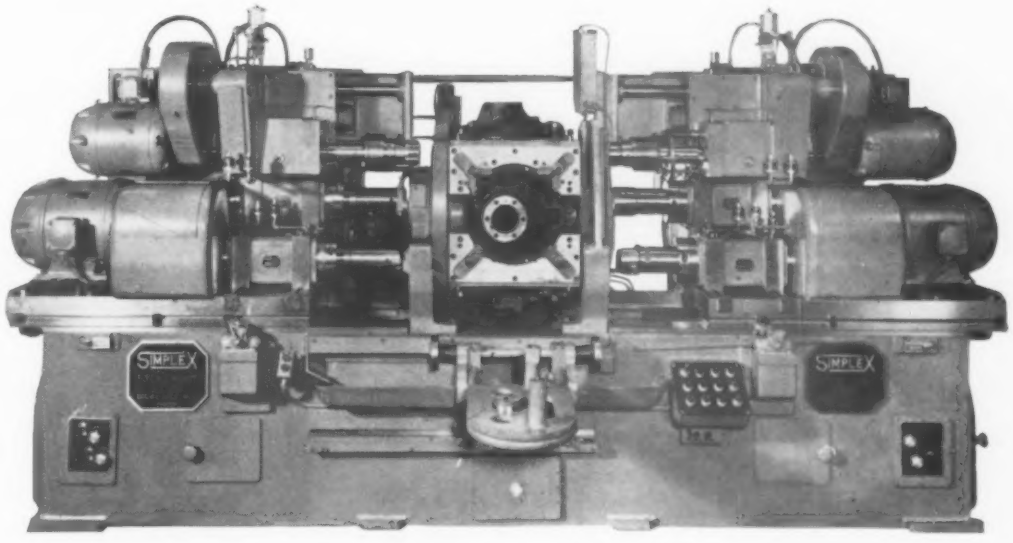

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Use MOTOR TOOL LIVE CENTERS

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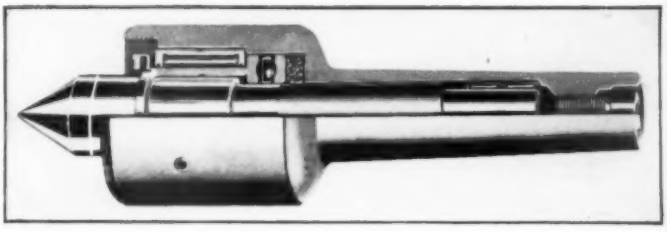

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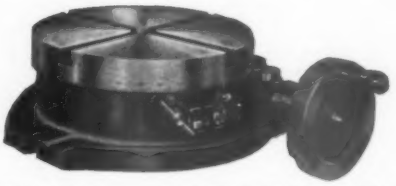

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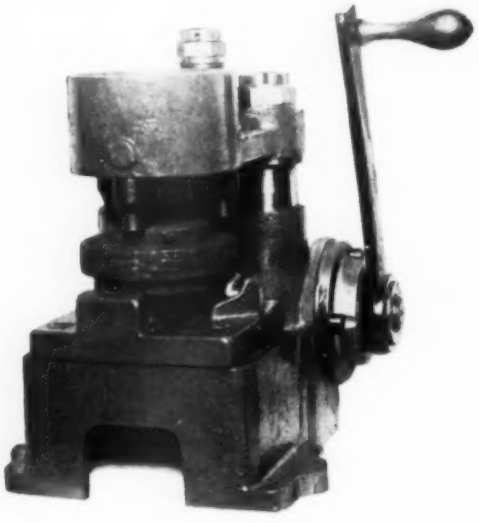

SWARTZ STANDARD DRILL JIGS AND FIXTURE LOCKS

AN APPLICATION SHOWING MERITS OF THE LS TYPE FIXTURE. ROUND PARTS CAN BE HELD AGAINST HEAVY DRILL TORQUE BY MAKING DRILL PRESSURE HELP THE CLAMPING. STEEL INSERTS SET ON ANGLE GRIP PARTS; WHILE TOP PLATE AUTOMATICALLY FOLLOWS UP ANY LOWERING OF THE WORK.

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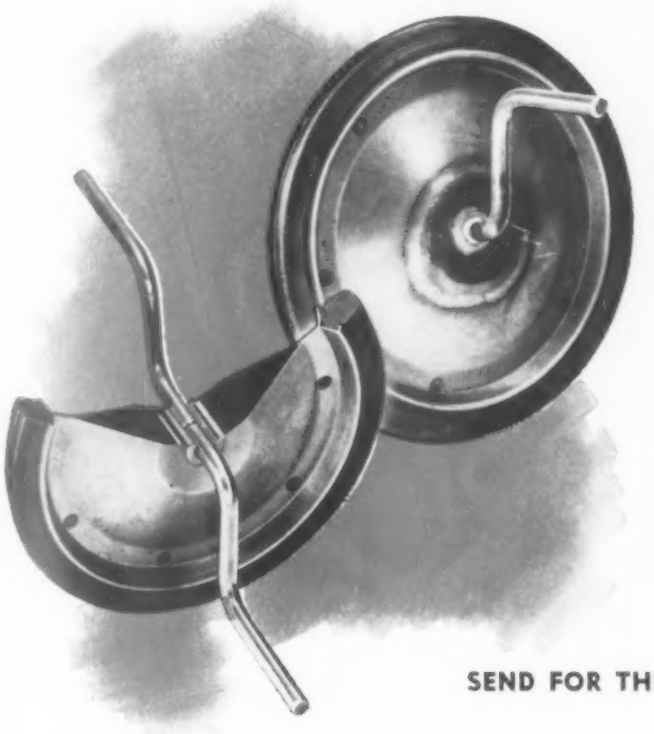
PUTS NEW SPEED INTO TRICYCLE WHEEL PRODUCTION

Here's another assembly job on which production was jumped 'way up and costs proportionately cut, by a change to EASY-FLO brazing. It's another example of metal joining being reduced to simplest terms by supplementing the use of EASY-FLO with a fast handling and heating set-up which eliminates the need for skilled brazers.



Above is the production set-up for brazing hubs and cranks to wheel frames. The girl applies flux and assembles parts in jigs on indexing table with two rings of EASY-FLO wire preplaced around the hub of each assembly. At heating station a split induction coil closes around the hub. Heating is automatically timed. The young man reverses wheels for brazing the other side and removes completed wheels. These two unskilled operators do it all—averaging 66 an hour. And when it comes to strength—the wheels would break before those EASY-FLO joints! That's simple, fast, economical metal joining.

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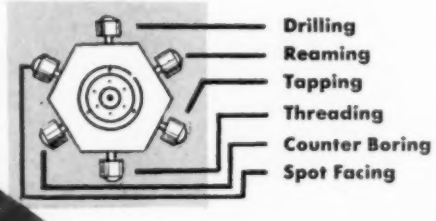

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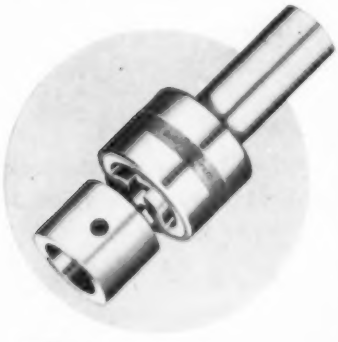

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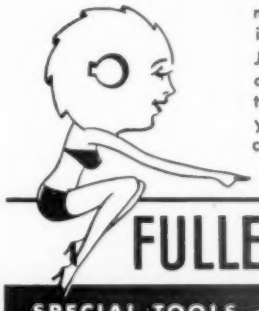

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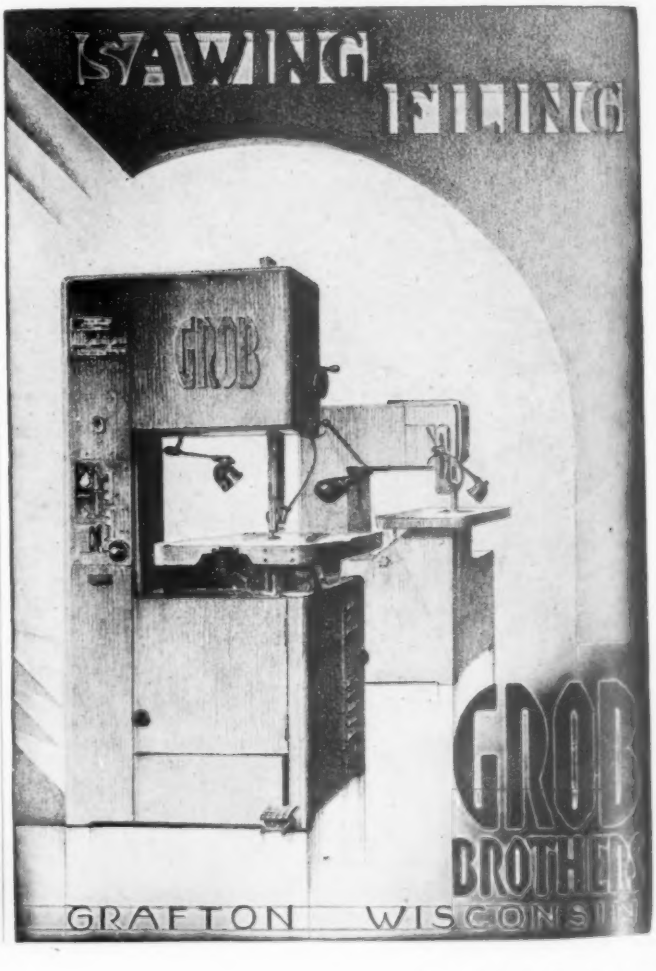

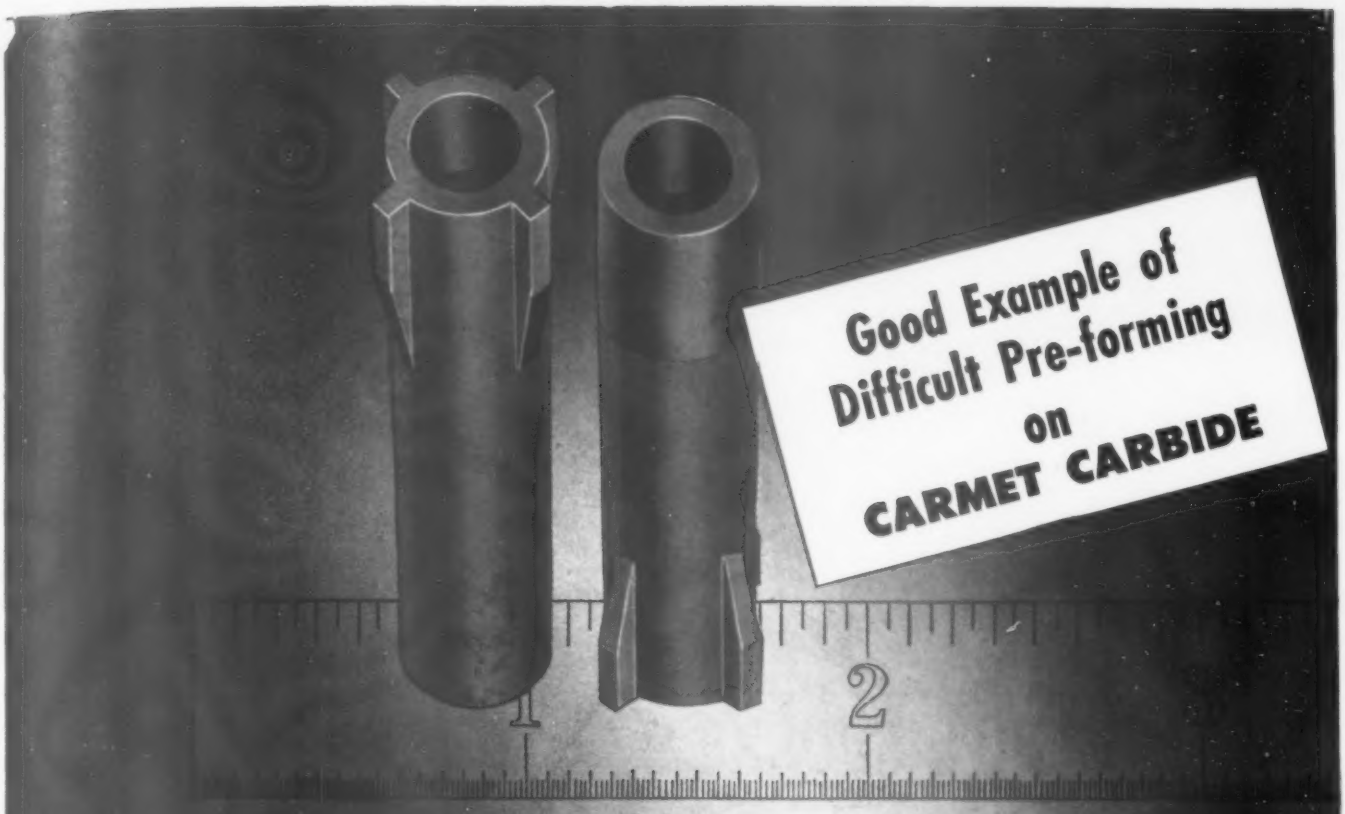

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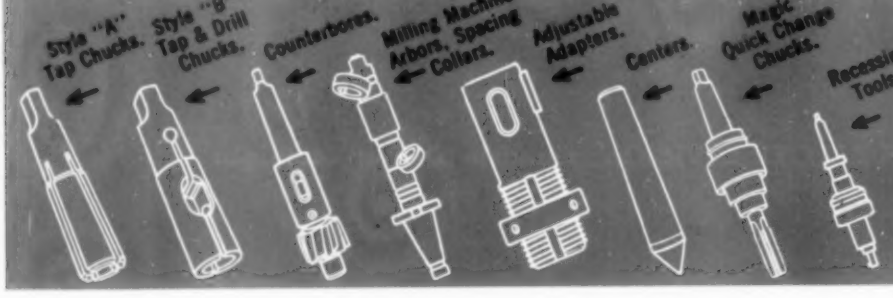

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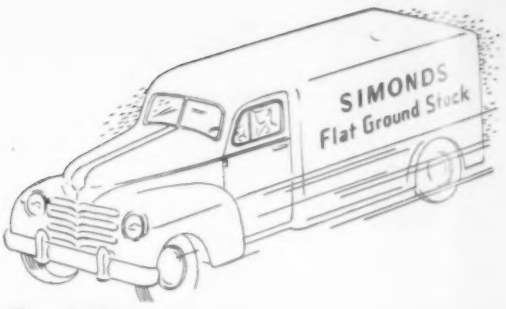

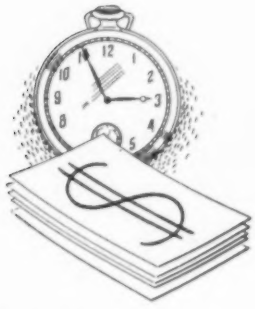

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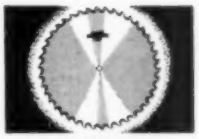
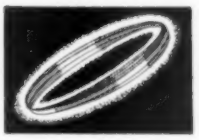


Circular Metal-Cutting Saws (Solid-Tooth, Inserted Tooth, Segmental)



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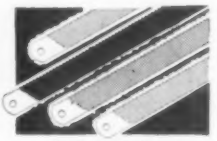

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BETHLEHEM STEEL

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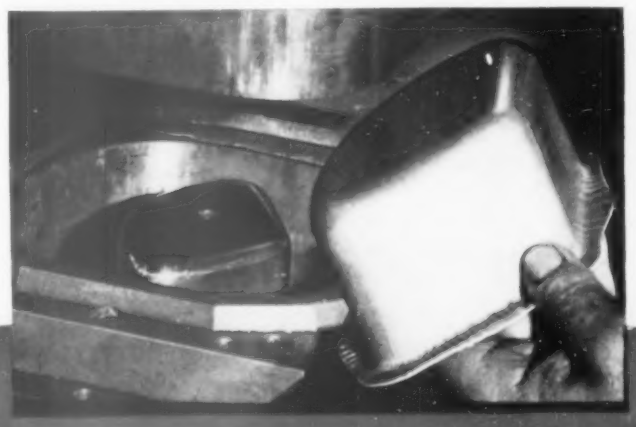
• • •

The BTR die shown below is used to blank and draw .032 inch aluminum stock (3 SO grade). By using BTR, the fit between the die halves can be kept within predictable close tolerances to assure proper flow of the metal during the draw, producing a clean surface and uniform thickness on this deep, one-stroke draw. This die has produced over a half-million pieces.



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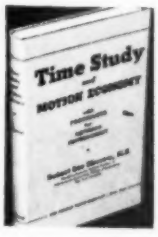

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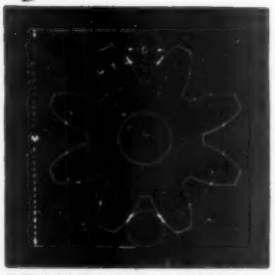

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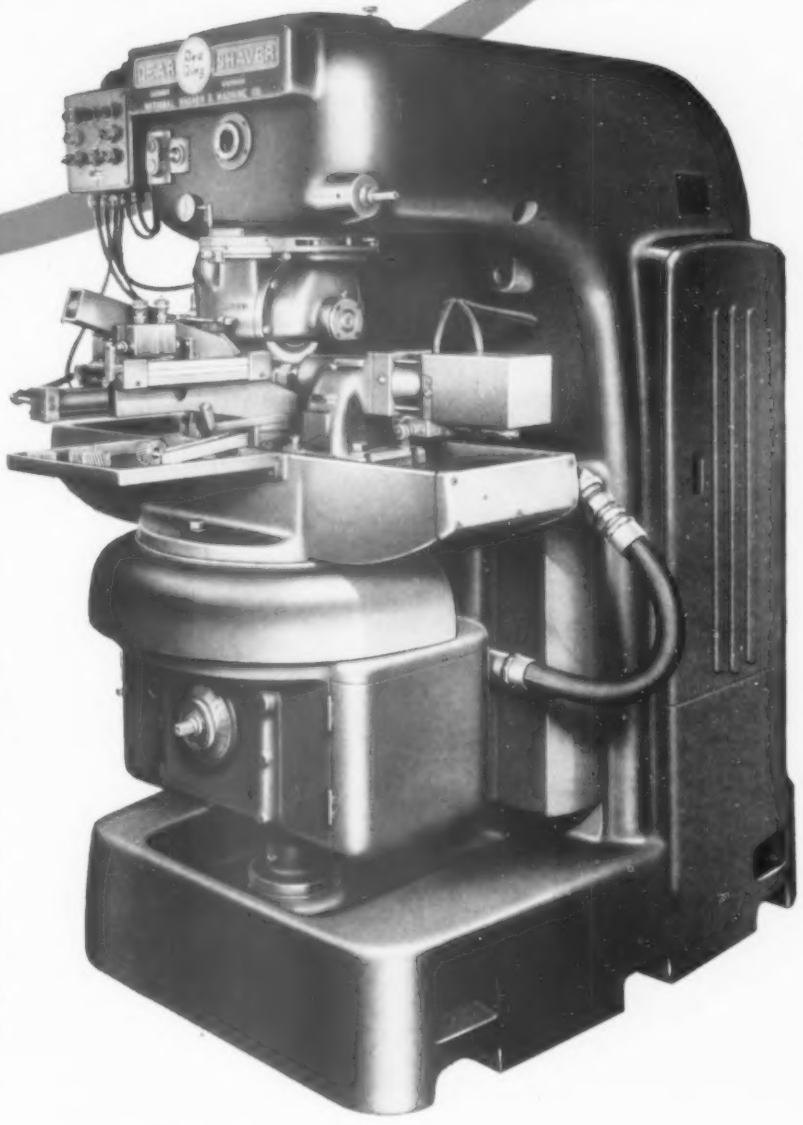

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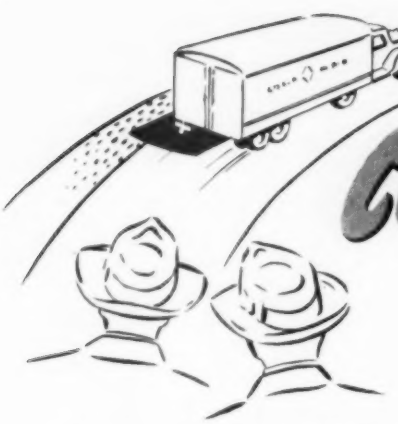

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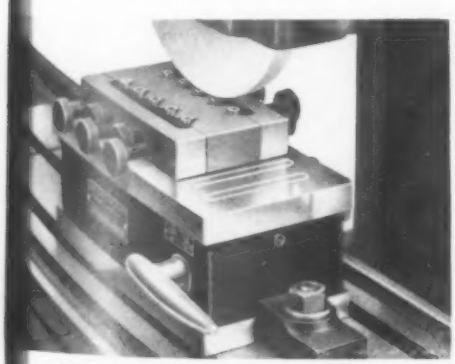
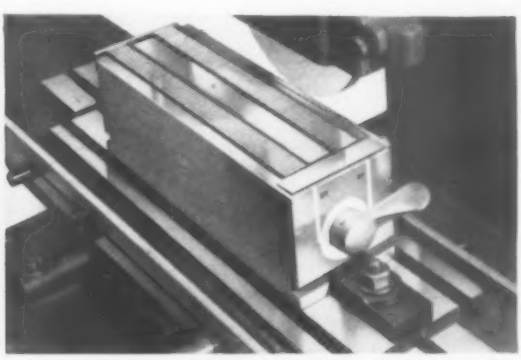
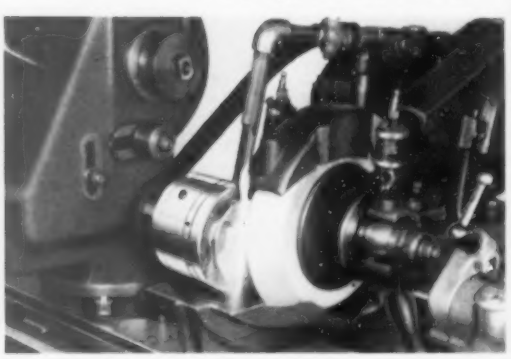


Grinding bushing ends on No. 408 Chuck



Group grinding on No. 412 Chuck



Disc grinding of pump part on No. 5R Chuck

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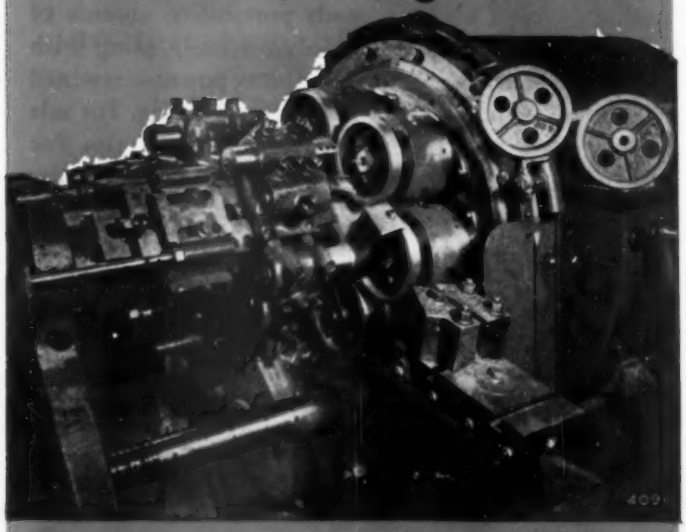

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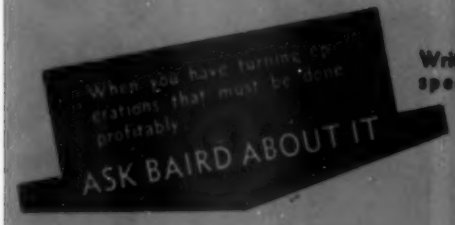

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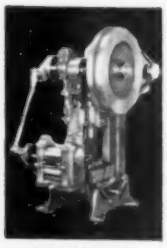

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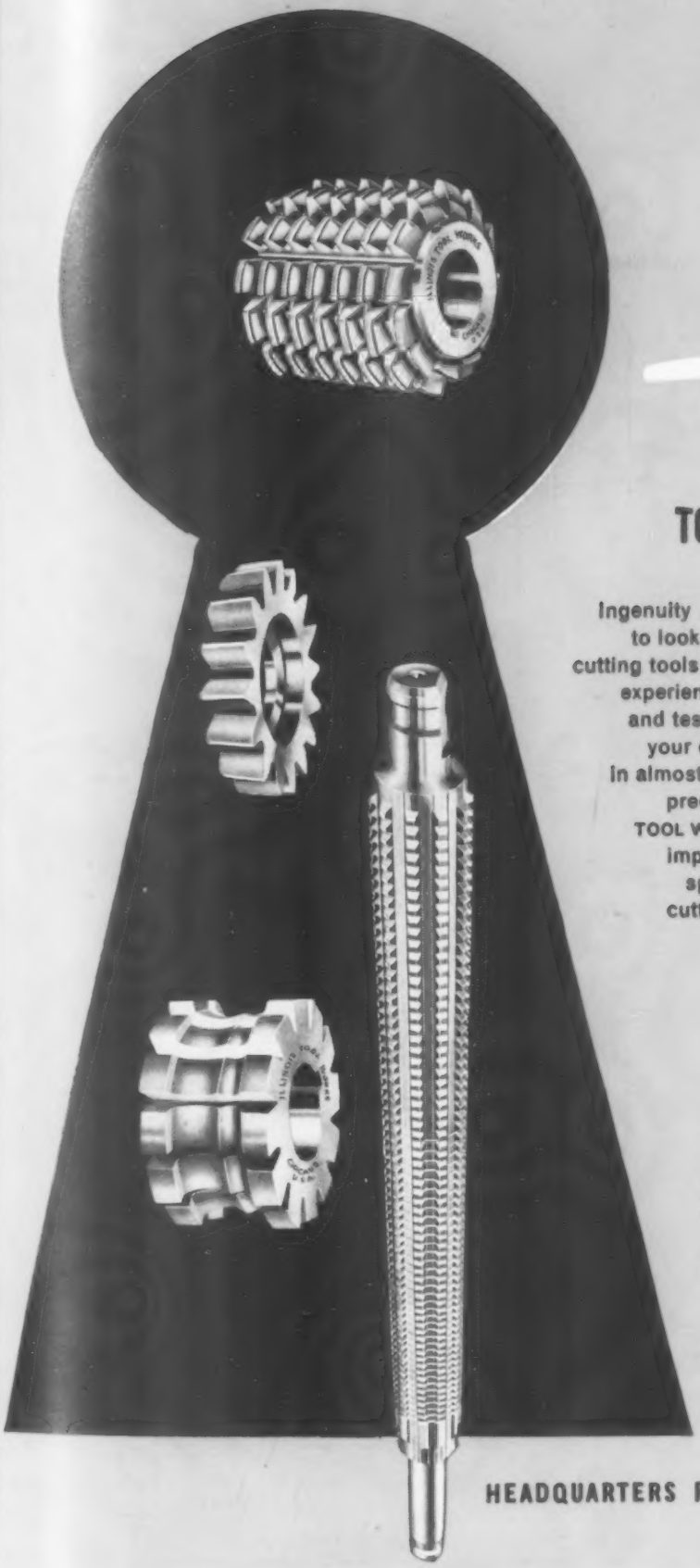

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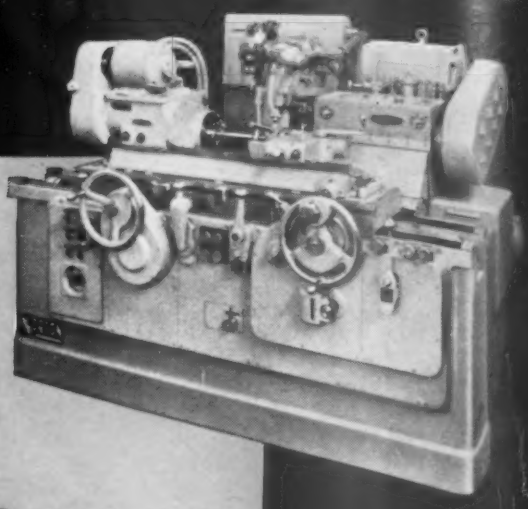

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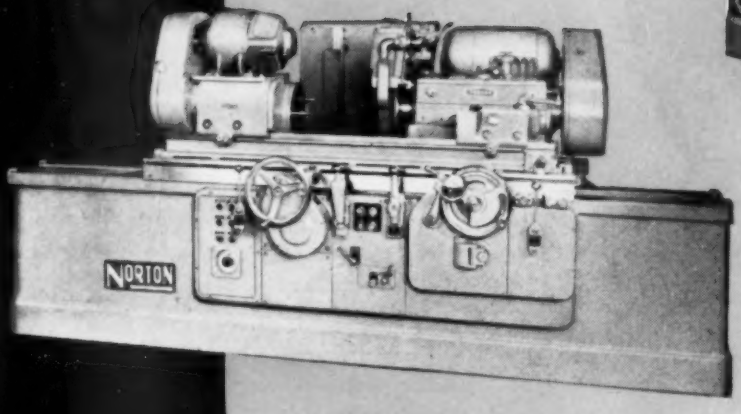

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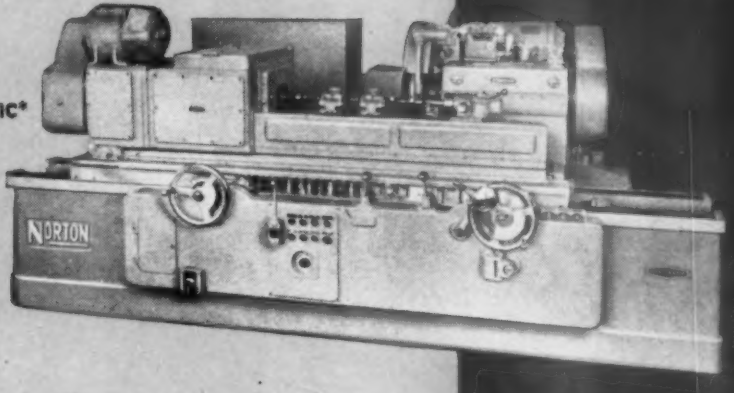

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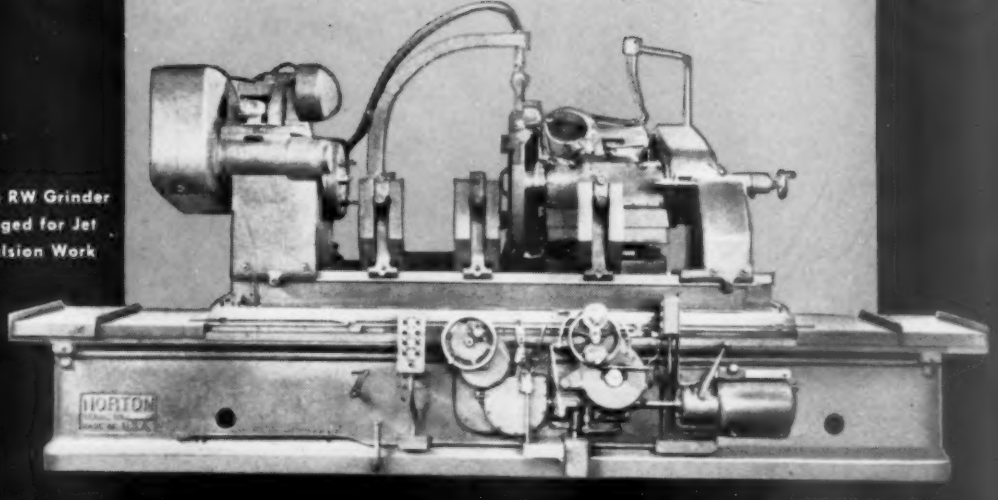

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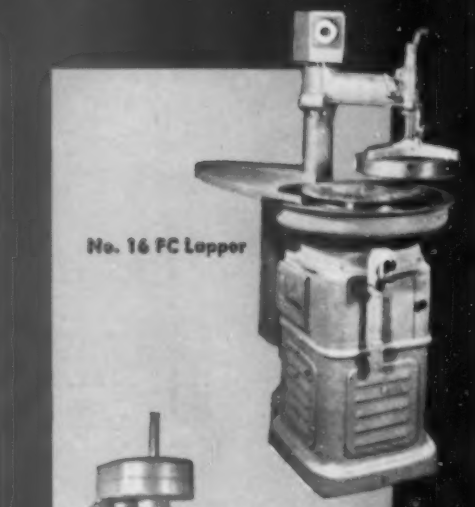

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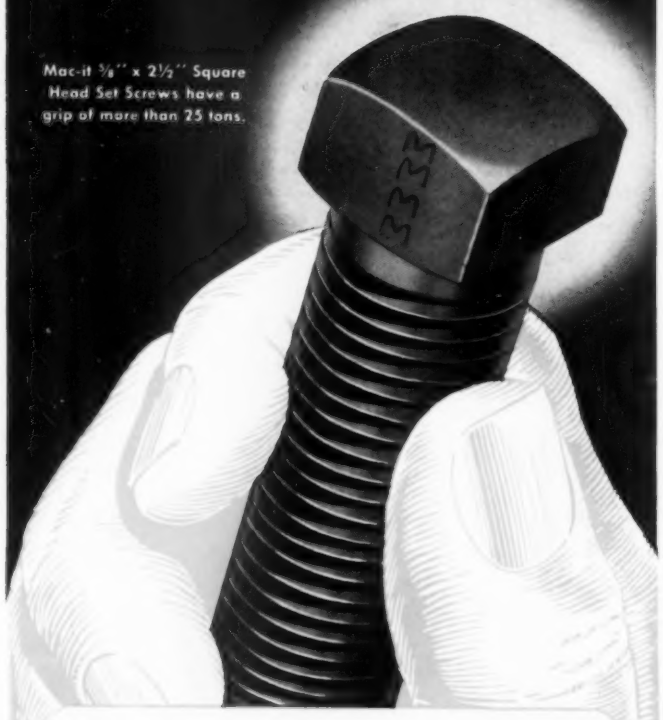

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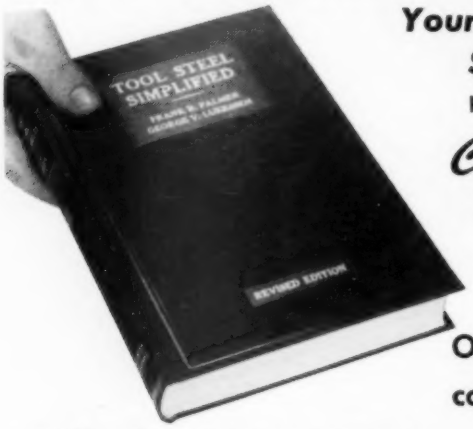

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7. The Twelve Matched Tool Steels
8. The Matched Set Method in Use
9. The Tool Steel Selector

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10. Heat Treating Methods and Equipment
11. Hardness and Toughness Testing
12. Properties and Heat Treatment of Twelve Matched Tool Steels
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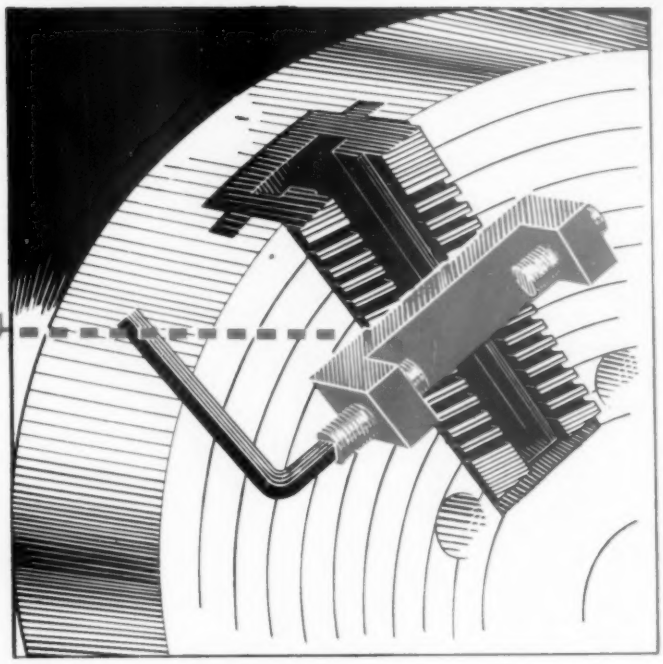

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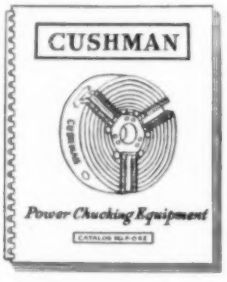

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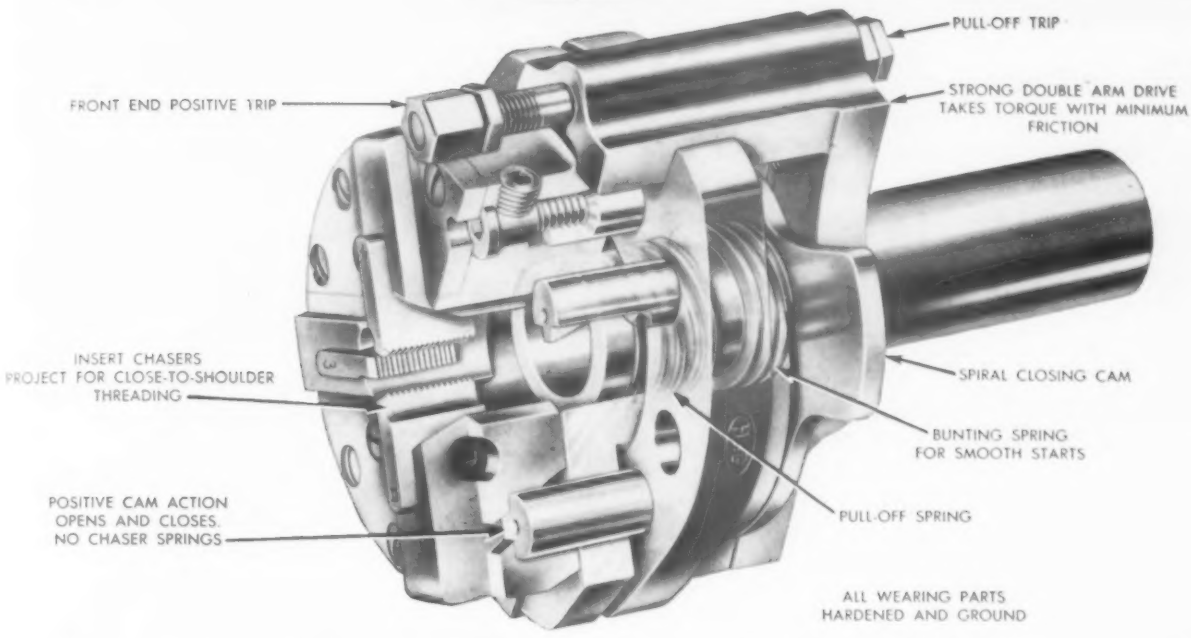
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For Faster Threading on B & S Automatics

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Brass Pieces threaded with Style DM Head on a No. 00 Brown & Sharpe Automatic. Speed of 6,000 r.p.m. Thread 4-40 American National. Time, one and one-half seconds, or at the rate of 2,400 pieces per hour.

Sprinkler brass part 5 16-24 thread cut with Style DM Die Head. Part completed on No. 00 B & S Automatic 6,000 r.p.m. in less than five seconds 100,000 pieces before grinding.

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Features of the Style DM Die Head

Front-end trip. Three advantages of the front-end trip mechanism are: (1) premature tripping cannot occur from fast indexing of the turret, because the mechanism need not be set for quick pull-out action; (2) tripping always occurs each time at the predetermined length of thread; and tripping need not depend on a dwell.) (3) threading can be done *close to a shoulder or very short threads can be cut.*

Pull-Off Trip. This is an always-ready safety device to open the die head if the turret should move back for indexing before the front-end trip functions.

Double-Arm Drive. Two arms hold the die-head body in proper relationship to the shank. They take the torque as far as possible from center, reduce the friction and ensure smooth action. The bunting spring assures a smooth, positive start on the thread, especially when the lobes of the threading cams are set 5% fast, a desirable condition in order to avoid thread damage from a hesitating start.

Insert Chasers. H & G *low-cost* insert chasers produce an unusual number of pieces before dulling, and any operator can change the complete set in a minute or so. No adjustments are needed. Proper location is inherent in the carriers. These features produce as much as an hour's extra production per day by the elimination of down time.

Full Range of Sizes. Style DM Die Heads are made in sizes to cover the entire capacity ranges of these Brown & Sharpe automatics: No. 00, 0, 2, 4 and 6. And the die heads can also be used on other single-spindle machines where a non-rotating tool is suitable.

In addition, to Style DM other styles of H & G Insert Chaser Die Heads are available for all machines on which threads are cut. All four styles of H & G Die Heads use the same chasers within their capacities. This reduces and simplifies chaser inventory.

WRITE FOR STYLE DM BULLETIN AND DIGEST OF NEW UNIFIED SCREW THREAD SYSTEM

H&G Insert Chaser DIE HEADS

THE EASTERN MACHINE SCREW CORPORATION

27-47 BARCLAY STREET, NEW HAVEN, CONNECTICUT

A Sure Way TO REDUCE TAPPING AND REAMING TIME

When you have a large number of tapping and reaming jobs, involving a small number of parts, you can speed up the operation tremendously with a Ziegler Tool Holder because it greatly shortens set-up time. Aligning the work with the spindle can be done much more quickly for the reason that with a Ziegler Holder the alignment does not have to be nearly so exact, the Ziegler Holder automatically compensating for inaccuracies up to 1/32" radius or 1/16" diameter. Consequently, with a Ziegler Holder production can be under way much sooner than would be the case if the set-up were made with a tool holder requiring meticulous alignment of the work with the spindle. Try it some time and see for yourself!

W. M. Ziegler Tool Co.
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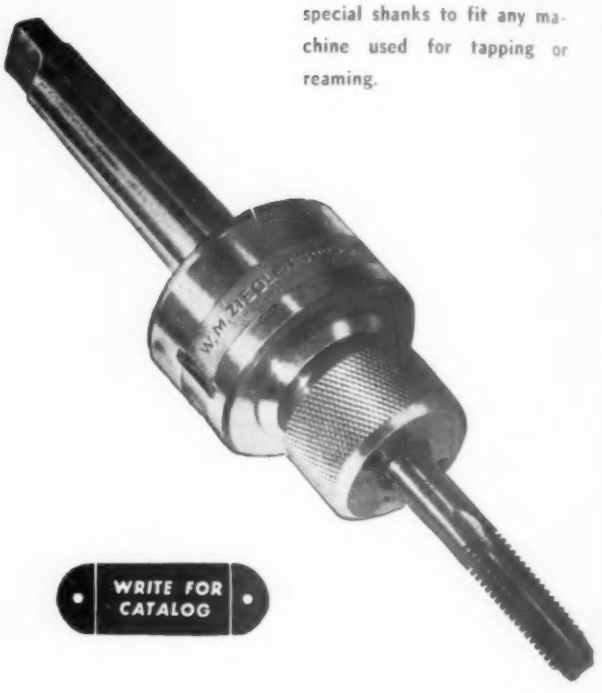
Ziegler ROLLER DRIVE FLOATING HOLDER for Taps and Reamers...

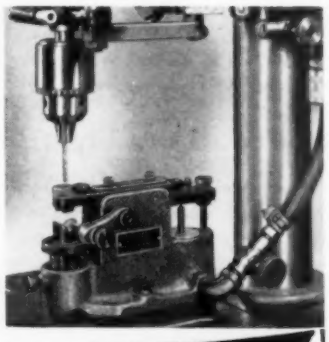
Made To Fit Any Machine

Furnished with male or female taper, straight, threaded or special shanks to fit any machine used for tapping or reaming.



WRITE FOR CATALOG

Here's a Lead Worth Checking



Por-Matic AIR-OPERATED UNIVERSAL Drilling FIXTURE...

Faster . . . Easier Set-Up . . . with LESS COST . . . that's the story of hole drilling with the Por-Matic Drilling Fixture. Production increases of 33% to 200% . . . and Por-Matic handles ferrous or non-ferrous rounds from 1/16" to 1" . . . extra units are available for drilling special shapes.

Por-Matic can be mounted singly or in groups on any regular bench or floor type drill press. Better check this lead NOW . . . it pays off in PROFITS!

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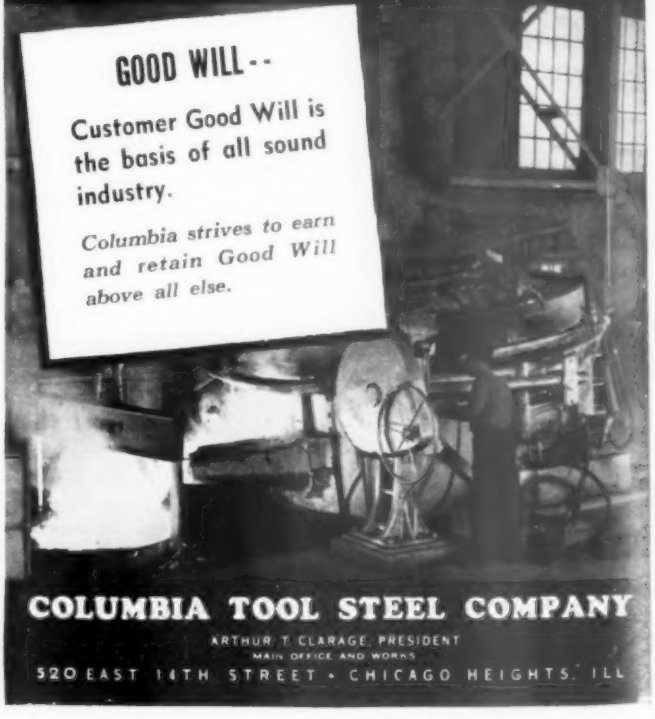
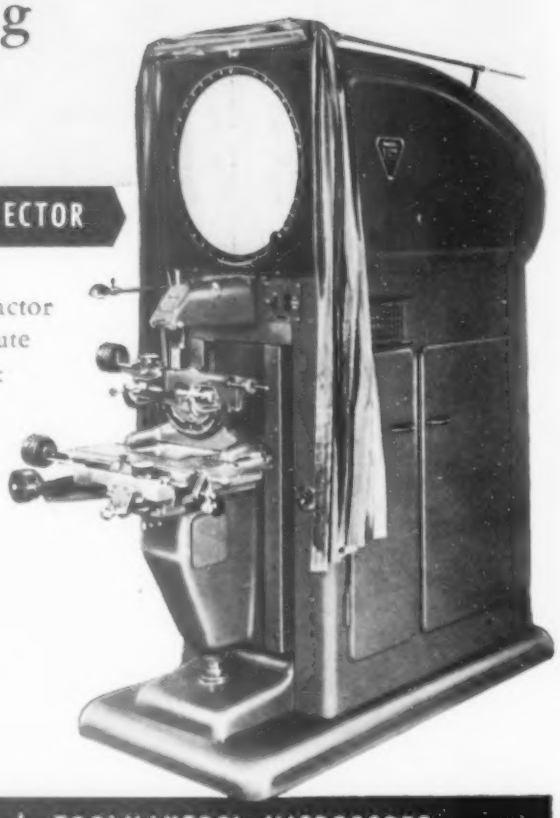
Columbia TOOL STEEL


GOOD WILL--
Customer Good Will is the basis of all sound industry.
Columbia strives to earn and retain Good Will above all else.

COLUMBIA TOOL STEEL COMPANY
ARTHUR T. CLARAGE, PRESIDENT
MAIN OFFICE AND WORKS
520 EAST 14TH STREET • CHICAGO HEIGHTS, ILL.

Save Man-Hours . . . *Save* Money . . .

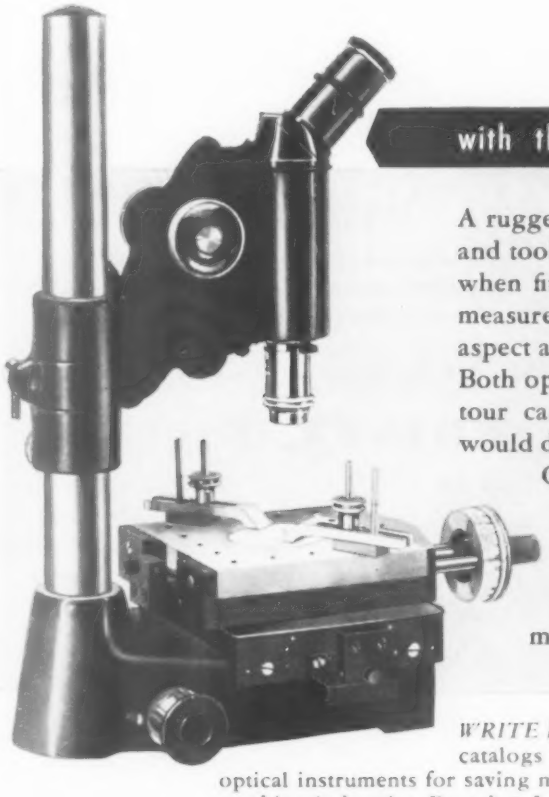
In Producing and Inspecting Tools and Finished Parts



with the Bausch & Lomb CONTOUR MEASURING PROJECTOR

No other projector gives you this accuracy. With the protractor screen, all angular measurements can be read to ± 1 minute of arc (1′). Direct linear measurements, reading to ± .0001″, can be made by means of the cross slide stage. The projected, magnified image of the object on the ground glass screen is sharp, and well defined.

Dimensions, angles, and profiles of production-run parts can be compared directly with a traced outline of the projected image of the master part, or with a large scale drawing superimposed on the screen. Inaccuracies are located quickly and simply. Catalog D-27.



with the Bausch & Lomb TOOLMAKERS' MICROSCOPE

A rugged shop instrument especially designed for the machinist and toolmaker. It is used for precision linear measurements and, when fitted with the protractor eyepiece, for precision angular measurements. Objects and movements are seen in their natural aspect and direction . . . not reversed as in ordinary microscopes. Both opaque and transparent objects of regular or irregular contour can be measured. It is ideal for measuring parts which would distort under pressure of the most delicate instruments.

Operation is exceptionally simple and fast. Linear measurements to ± .0001″ can be made by means of the cross slide stage, controlled by two micrometer screws, and angular measurements to ± 1 minute of arc (1′). Various other attachments are available to meet special measurement problems. Catalog D-22.

WRITE FOR COMPLETE INFORMATION . . . The above listed catalogs illustrate and describe these and other Bausch & Lomb optical instruments for saving man-hours, and maintaining accuracy standards in metal working industries. Bausch & Lomb Optical Co., 763-B St. Paul St., Rochester 2, N. Y.

BAUSCH & LOMB

OPTICAL COMPANY ROCHESTER 2, N.Y.

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We specialize in the fabrication of the smaller sizes of precision stampings and coinings, in all metals.

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Chicago Representative Wanted

to Sell Broaching Tools

Territory open includes Chicago and the entire state of Illinois

Well established maker of broaches anxious to hear from Chicago firm able to sell a quality product. Liberal commission paid to firm giving aggressive representation.

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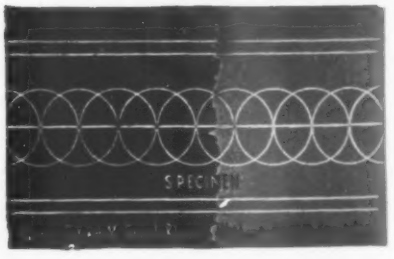
STOPS LOSSES

making dies & templates



Simply brush on right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

Write for full information

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Want to CUT COSTS? See EX-CELL-O

EX-CELL-O Special Machine Combines Operations to Save Handling...Save Man Hours...Save Space

This Ex-Cell-O Special Machine for turning the tapered ellipse on automotive pistons does a complicated machining job while still maintaining a high rate of production and fine finish. Ex-Cell-O used as a basis for this operation a standard Style 61 Precision Cylinder Boring Machine. Production is 180 pieces per hour net. The engineering "know-how" that makes a job like this possible is available to you through Ex-Cell-O. Write Ex-Cell-O in Detroit today!

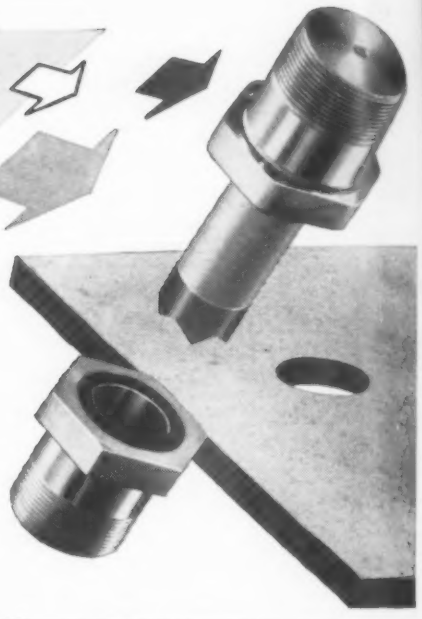
49-8

EX-CELL-O CORPORATION DETROIT 32

Special Multiple Way-Type Precision Boring Machines • Special Multiple Precision Drilling Machines • Precision Boring, Turning, and Facing Machines and Fixtures • Precision Cylinder Boring Machines • Precision Thread Grinding Machines • Precision Lapping Machines • Precision Broach Sharpening Machines • Other Special Purpose Machines • Tool Grinders • Continental Cutting Tools • Broaches and Broach Fixtures • Counterbore Sets • Grinding Spindles Hydraulic Power Units • Drill Jig Bushings • R.R. Pins and Bushings • Fuel Injection Equipment • Dairy Equipment • Aircraft and Miscellaneous Production Parts

Get Far Greater Press Output!

on SIMPLE work...



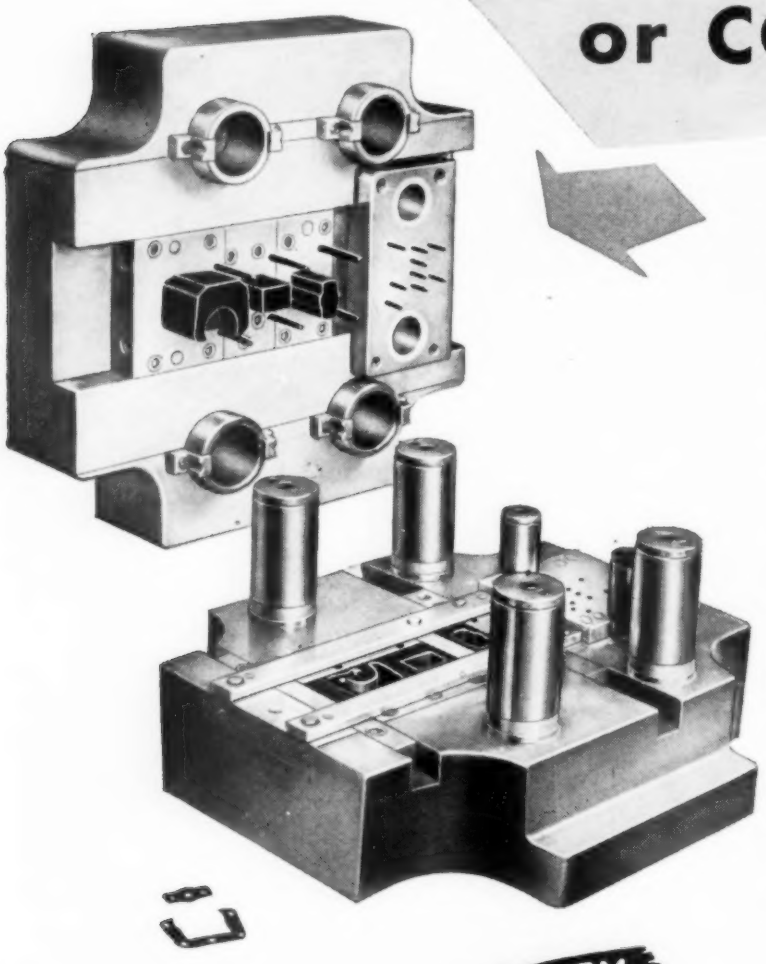
On a simple punching operation, this Carboloy punch and die lasted *12 times longer* than its steel predecessor!

In punching holes through abrasive Plaster Wallboard, steel dies wore .012" to .015" every 170 hours—

—while dies and punches of Carboloy Cemented Carbide show wear of only .0025" to .003" after 380 hours of continuous operation!

The Carboloy dies are bringing savings, not just in replacement *costs*, but in replacement *time*, as well.

or COMPLEX...



In complex dies, too, Carboloy brings the same longer die life, lower replacement costs and downtime, finer tolerances, better finishes.

This complex, five-station progressive die is an example. With unbelievable accuracy and efficiency, it produces millions of rotor and stator laminations.

Whether you need standard dies available from Carboloy; simple Carboloy dies that you can make in your own shop; or complex dies available through many die shops, you will find that Carboloy brings you advantages in drawing, cupping or blanking that you can find nowhere else.

A Carboloy engineer will gladly call on you any time to help you with any problem. Send for the Carboloy DIE ENGINEERING MANUAL, D-124, to find out more about the advantages Carboloy Cemented Carbide can give you.

CARBOLOY COMPANY, INC.

11101 E. 8 MILE AVE. • DETROIT 32, MICHIGAN

FOR GREATER PRESS OUTPUT

SPECIFY **CARBOLOY®**

CEMENTED CARBIDE DIES

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The directors of your manufacturing company announce the regular quarterly dividend of 10% payable to stockholders of record . . .

40% annual return on an investment in New Britain Automatics is commonplace

REPLACEMENT of old machines (even those in good working condition) with New Britain modern automatics frequently shows this or greater return on the basis of direct labor savings alone . . . with substantial extra dividends in overhead, recovery on equipment replaced and other factors.

The peculiar fact about modern machine tools as an investment is that the person who fails to make the investment is the one who runs the risk, because he endangers his ability to compete successfully.

Have you examined your equipment from this viewpoint recently? It's a simple process. Your New Britain representative with the help of our Estimating Department is available to assist you in analyzing your own machine replacement program.

We know you would benefit by having a talk with any one of the following sales engineers. Write, wire or call collect:

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Mr. F. H. Hastings
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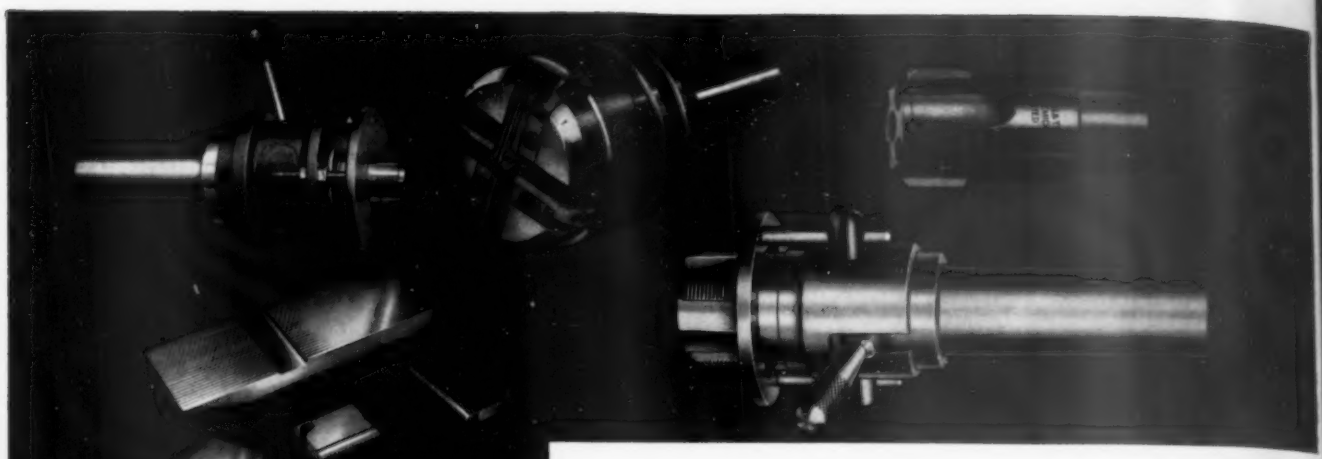

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Murchey collapsible taps, self-opening die heads, and special threading tools represent the newest, most modern threading tools of their kind available to industry. They have been engineered to the pace set by modern production requirements. Outstanding and exclusive features contribute to *lowest cost per thread.*

Call for a Murchey man to work with you on your threading problems—no obligation.

Catalogue available upon request.

Lowest cost per thread . . .
WITH MURCHEY TOOLS

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